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THE CREATION OF SMALL HOLDINGS UNDER THE ACT OF 1907.

MRS. ROLAND WILKINS (L. JEBB).

It is proposed to publish monthly in this *Journal* a series of articles on the small holdings in various districts of England which are already well established, in the hope that the available experience of the past may furnish some guidance to those who are confronted with the problem of working the Small Holdings Act of 1907 ; alike to those who are desirous of working small holdings themselves and to those who are promoting schemes for the benefit of their neighbours. These articles will, it is hoped, furnish full details as to the specific cases in question ; but I have been asked, by way of introduction, to contribute a survey of the general principles which it is necessary to take into consideration.

I propose to say a few words, in the first instance, as to those districts where small holdings already exist, and where the only problem is to encourage their extension and development to the fullest possible degree. After that I shall deal with the more difficult question of the creation of small holdings in new districts ; and I shall endeavour to proceed on two lines. I shall, in the first place, assume that it is essential to derive the utmost possible guidance from the teaching of the past as to the natural development of small holdings, and endeavour to summarize the inferences which may be drawn from a study of it. Secondly, I shall consider the data we have which serve to

indicate how far it is possible by introducing improved methods to modify the so-called natural conditions.

Where small holdings already exist there are, of course, plenty of data to guide future endeavours, and considerable activity is being shown in making full use of the powers conferred by the new Act. I need only instance the Worcester-shire and Lincolnshire County Councils, which are fortunate in possessing local pioneers who have already laid the foundations for a successful working of the Act. In these places, therefore, the problem is not that of determining what type of holding to establish : the principal questions are whether a further supply of suitable men exists amongst the applicants, and whether a market can be found for the disposal of further produce.

As regards the first point, small holdings breed small holders and a large percentage of applicants are sure to be desirable.

As regards the question of markets, care will be required to ensure that the increase of supply from small holdings does not damage existing workers. It might be supposed that conditions would adjust themselves throughout the country and that accordingly any additional output would be absorbed without difficulty ; but experience shows that the market for the produce of small holdings is often glutted locally, and one not infrequently hears complaints, even from existing small holders, that, for these reasons, it is not possible to obtain the prices which ruled some years ago.

My conclusion is that any county council which contemplates encouraging the extension of existing holdings would do well to consider seriously this question of markets. Supposing that the prospect is unsatisfactory, it should put to itself three questions :—

- (i) Can the difficulty be met by reformed co-operative methods of distribution and marketing ?
- (ii) Can the small holders trek out further afield, so as to come within a manageable radius of a new market.
- (iii) As a further alternative, can the new holdings be concerned with a different form of produce from the old ?

I now turn to the case of localities where small holdings are a new and untried experiment, or where they exist solely as minor appendages to other occupations, sparsely scattered among

larger farms. In these instances numerous questions arise at once : What type of holding are we to go in for ? Can we run any sort of small holding anywhere, or must we adapt the type to the special conditions of the district ? If so, what circumstances are essential to success ? If once we get a clear idea on these points, we shall be better able to cope with the practical side of the question ; and the practical experience of the past gives us plenty of data upon which to form such ideas. There are not so very many parts of England where some form or other of small holdings does not exist. Moreover, when such holdings have occurred naturally, each district seems to have given rise to a special type of its own. It will repay us to examine what has determined this special local type and then to consider, in the establishment of new holdings, how far we should do well to be influenced by these local conditions.

We can leave to a later stage a further question : to what extent can we artificially mould and alter conditions so as to make a given type of small holding succeed anywhere.

What, then, has determined the types of small holdings in the various districts ? We find that the type is invariably an outcome of certain local conditions ; our inquiry therefore resolves itself into a study of what these conditions are which have conduced to the success of holdings in the different localities. An attempt has been made to classify what appears at first to be an endless variety of local reasons. The result has made clear the two following points :—

- (i) That there are certain definite conditions which, under known methods of cultivation, are essential to the successful establishment of small holdings.
- (ii) That in any district the existence of *one only* of these conditions has been sufficient to ensure success.

Before tabulating these conditions it will make things clearer to consider for a moment what a small holding implies. It is obvious that if a living has to be produced off a small area—(1) this area must be relatively very productive, or produce crops for which relatively large cash returns are obtainable ; or (2) there must be some means of supplementing the actual return from the land itself.

Under the first heading the necessary qualifications are one or other of the following :—

(i) *Good land*, producing a large return in kind, with little initial outlay and expense of working ; or

(ii) *A forward climate* (induced perhaps only by a sheltered aspect in an otherwise backward district), enabling early market prices to be obtained for the produce ; or

(iii) The *vicinity of a good market*, enabling the disposal of produce and the purchase of manure at a price which will compensate for the enhanced expense of manuring and cultivating unsuitable soil, or the expense of growing under glass, &c., in a backward district.

Under the second heading, viz., qualifications which serve to supplement the actual return from the land itself, we get :—

(i) Supplements to the land itself, such as, the existence of common rights or co-operative grazing grounds, or ;

(ii) Opportunities for supplementing the weekly cash returns, such as, surrounding agricultural conditions affording piece-work, dyking, quarrying, or work in woods ; the existence of special local trades, or the proximity of mines or factories.

In considering any locality, therefore, for starting a scheme for small holdings, the first thing to do is to see that one or other of the above conditions is present. I would here, however, lay very special stress on one point. It is so often said of small holdings that to be a success they must be on good land and near good markets that people now tend to accept this placidly as a truism. But the fact that it is true up to a certain point only makes it as absurd to lay too much stress upon it as it is dangerous to ignore it. For when we come to examine the places where small holdings are actually succeeding, we as often as not find one or both of these two factors absent. A glance at the tabulated conditions above will explain this ; for the presence of any one of the conditions there named has been proved to be sufficient, in the absence of all the others, to establish the prosperity of the holdings in the neighbourhood to which this condition applies.

Having considered any locality in the light of suitable conditions, what is the next step ? The particular type of holding it is proposed to create will have to be settled. And it will probably be found that the type of cultivation will be determined by the nature of the local condition which has led

in the first instance to the supposition that the neighbourhood is suitable for the creation of small holdings. For instance, a forward district will suggest the production of those fruits and vegetables for which very high prices are obtained when they are the first of their kind on the market ; the presence of common rights will give rise to small agricultural holdings for the rearing or fattening of the stock turned out ; or, if the applicants for new holdings are partly employed in some industrial pursuit or have many opportunities for piecework, it is likely that the holdings would be most advantageously used for the growing of produce for home consumption.

So far I have been treating the subject as though the initiation of new holdings were to approximate to a process of natural evolution, the new holding growing, as it were, out of the particular conditions of its environment. But how far is this the right line to take ? It certainly is the safest so far in those places where there are good examples to follow, for this reason : the only education our small holders are receiving for the moment is the education of experience. Give a man a plot of land in his own locality which he can cultivate in the particular way he is used to, and the chances are that he will succeed. But put the average man under new conditions, or try and make him work on lines to which he is not accustomed, and the chances are he will fail. Now it will generally be found that in those places where no special circumstances have given rise to an independent and special form of small holding, that cultivation on a small scale is merely an imitation of the large farming in the district. That is to say, you tend to find little grass holdings in the districts of large cheese or grazing farms, and (although to a lesser degree) little arable holdings in the corn and fattening districts. In the less prosperous parts of England these small native holdings are, only too often, of a type one would certainly not wish to see perpetuated, however much they were characteristic of the neighbourhood ; I allude to the struggling survivals of more prosperous days, with their bad stock and bad seed, their time-wasting implements and their antiquated methods of cultivation and marketing. These are living arguments in favour of the introduction of new ideas. We have, therefore, the two aspects of the case to consider : the desirability of fostering and of making use of the local man's

innate capabilities, and the necessity of making him take to more enlightened methods.

This leads to the last consideration of my paper : What data have we to show the possibilities of success in inducing new forms of cultivation ?

Fortunately it is not necessary to expound mere theories when one talks of enlightenment in matters of cultivation. We have many instances to show how the accidental intelligence of one man has determined the type of holding in some comparatively modern establishments of small holdings in certain districts. To mention one or two concrete cases : The holdings in the early fruit-growing districts of the valley of the Tamar in Cornwall owe their existence to the fact that a young local farmer, up in London for the Exhibition of 1862, was struck by the high price obtained for strawberries in Covent Garden, which he knew were no better than those growing in his father's strip of garden. He turned his attention to supplying this demand for early fruit, and in a few years all his neighbours followed suit ; the result is that what was once poor agricultural land is now highly rented land intensively cultivated by small men. The favourable local condition here is the forwardness of the locality, but this was not turned to the advantage of small holders until one man had discovered its significance.

Again, the seed-growing industry at Tiptree in Essex, in which a very large number of small holders are concerned, was introduced by a working man from the neighbouring district of Coggeshall. He started in a small way and taught his fellow workmen the art of dressing the seed. The suitable conditions here for this particular form of holding are a very low rainfall, much sun, and a naturally dry soil ; but the fact that these parts are not still mediocre farm land is due possibly to the enterprise of one intelligent man.

These cases serve also as instances of how, a place being found specially suitable for the growth of certain articles, the question of a market for them followed as a corollary.

We have, however, instances of how the opening of a market for special produce in any particular district has given rise to the profitable production of that article. A good example of this is the establishment of Chiver's jam factory near Cambridge,

which has caused hundreds of little fruit holdings to spring into existence.

All the cases mentioned above lead us to conjecture possibilities of the same kind in places yet unknown to the small holder. I do not propose to go into this as the paper is limited strictly to the consideration of known facts in England. I would merely at this point remind my readers that the foreigner has eliminated his dependence on natural conditions. The Dane has eliminated the factor of proximity to markets by his methods of co-operation ; the Frenchman has eliminated the factor of good land by making his soil artificially, and the factor of climate by hot water pipes under the ground. These undertakings still border for us on the nature of experiments ; and those responsible for the working of the Small Holdings Act in the rural districts may not feel justified in undertaking experiments. While, therefore, I do not wish to belittle in any way such experimental methods, I would urge that the basis of any new undertaking should be a systematic consideration of the surrounding conditions in connection with a study of the lessons of other places.

FARMYARD MANURE.

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I. LOSSES DURING MAKING AND STORAGE.

Farmyard manure, foldyard manure, yard manure, and dung are all terms employed in various parts of the country for the same more or less decomposed mixture of the excreta of domestic animals with the straw or other litter that is used in the yards or stalls to absorb the liquid portions and keep the animal clean. Probably it would be more correct to retain dung as a name for the excreta alone, and farmyard manure for the product that leaves the yards, but it is impossible in practice to observe any such distinction. It follows from its origin that the composition of farmyard manure must be far from constant, varying with the nature of the animal making the dung, the kind and amount of food it receives, the proportion between excreta and litter, the nature of the litter, and the extent and character of the decomposition that

has taken place in the manure itself. The composition of the excreta being the largest of these factors, it will be necessary first of all to trace the fate of the various manurial substances in the food—compounds of nitrogen, phosphoric acid and potash—during the process of digestion. Animals that are not increasing in weight, such as working horses or full-grown cattle which are being maintained in store condition, excrete the whole of the nitrogen, phosphoric acid and potash they receive in a liquid or solid form, the carbohydrates and fat of the food being mostly got rid of as gases. But the fate of the manurial constituents varies according as they are present in the food as digestible or indigestible compounds; for example, part of the proteins of the food withstand the action of the digestive ferments and are excreted unchanged in the faeces, but to a much greater extent they are broken down into soluble compounds which pass into the blood and eventually are excreted as urea, uric acid, &c., in the urine. Similarly for the phosphoric acid and the potash in the food—whatever is digestible is excreted in the urine in some simpler combination, whatever resists digestion passes out unchanged in the solid excreta. Hence a great difference in the manurial value of the two portions of the excreta; the compounds in the urine—urea, uric acid, soluble phosphates and potash salts—are either ready for the nutrition of plants or require but slight further changes to become so; whereas in the solid dung the materials have several stages of decomposition to go through before they can reach the plant, and, having already shown themselves able to resist the attack of the animal's digestive ferments, they are correspondingly unaffected by the ordinary decay processes in the soil. The proportion the digestible bear to the indigestible constituents of a food varies with the nature and even with the mechanical condition of the material, also with the kind and age of the animal; roughly speaking, the richer the food the greater the proportion that is digestible, e.g., decorticated cotton cake contains 7 per cent. of nitrogen, of which 87 per cent. is digestible and finds its way into the urine, while hay only contains 1·5 per cent. of nitrogen, of which only 50 to 60 per cent. is digestible.

When the animal consuming the food is growing or fattening or yielding milk, a certain proportion of the manurial con-

stituents in the food are retained, the proportion varying with the nature both of the food and the animal. Cows in milk and young growing animals take the greatest toll from their foods, animals in the later stages of fattening the least. If, for example, 100 lb. of linseed cake be fed to milch cows and oxen nearly fat respectively, the manurial constituents contained in the cake will be distributed in each case as shown in Table I.

TABLE I.

	In 100 lb. Cake.	Fattening Oxen.			Milch Cows.		
		In Meat.	In Urine.	In Faeces.	In Meat.	In Urine.	In Faeces.
		Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
Nitrogen ...	4.75	0.21	3.88	0.66	1.32	2.75	0.66
Phosphoric acid ...	2.0	0.14	0.09	1.77	0.5	0.07	1.43
Potash ...	1.40	0.02	1.10	0.28	0.14	1.05	0.21

It is thus impossible to state the composition of the excreta of the various farm animals except within certain wide limits, owing to the variations induced by the food and the age of the animal.

The urine of sheep and horses is more concentrated than that of cattle and pigs, similarly the solid excreta of the two former are also the drier. It is this greater dryness and richness which causes the gardener to describe horse manure as "hotter" than that produced by either cows or pigs; bacterial changes take place in it much more rapidly, a greater amount of ammonia is produced, and the rise of temperature is more pronounced.

The next factor which enters into the composition of the dung is the nature of the litter on which the animals are placed; from time to time, especially among small holders, various materials, such as bracken fern, hop bine, leaves, even manufacturing refuse like spent tan and sawdust, are used, but on a large scale only two—straw, and to a less extent, peat moss litter—get employed. The litter has a twofold function: it absorbs the urine and other liquid portions, and it provides both organic matter and nitrogen for the resulting manure. The cereal straws contain about 0.5 per cent. of nitrogen,

0·2 per cent. of phosphoric acid and 1·0 per cent. of potash, the variations in composition between individual samples of any one kind of straw being as great as the variation between average samples of wheat, oat and barley straw. Speaking generally, straw grown in the north of England and Scotland is richer than straw grown in the south and east of England, because the vegetative growth has been more prolonged and the migration of food materials from the straw into the corn has not been quite so thorough. Straw will absorb from two to three times its weight of water, but again the variation in absorbing power between different samples of the same kind of straw is greater than that between different kinds of straw. In practice, wheat straw is the most highly esteemed, as cleaner and wearing better under the feet of the animals than any other kind of straw; oat straw comes next and is often almost as good as wheat straw; barley straw is least liked, as it is often brittle and dusty.

However the farmyard manure has been made, it thus starts with a mixture of excrement, urine, and litter, which become more or less consolidated and mixed together by the trampling of the animals. Other changes, however, intervene very rapidly, and these, in the main, are brought about by bacteria, which for convenience, may be divided into two groups, one acting on the cellulose and other carbon compounds of the straw that make up the bulk of the manure, and the other acting on the nitrogenous compounds that do not weigh so much but supply the main fertilising properties of the dung.

Among the more important of the organisms dealing with nitrogenous material are those which attack the urea in the urine, and by adding to it the elements of water, give rise to a carbonate of ammonia which very readily dissociates into free ammonia and carbonic acid, both gases, and therefore capable of escape into the atmosphere. This change into ammonium carbonate is an extremely rapid one; in the liquid draining from a yard or a manure heap, or even in the liquid manure tank, little or no urea can be detected, so complete has been the change to ammonia. As long as the liquid containing the ammonium carbonate is protected from evaporation no loss of nitrogen will result, but the more surface it exposes to the air and the higher the tem-

perature the greater will be the amount of ammonia passing off in a gaseous condition. Thus thin films of urine on the floors, walls, or even on the surface of loose straw easily lose nitrogen by the fermentation of the urea and subsequent volatilisation of the ammonia ; the smell of a stable arises in this way and is clear evidence of the escape of ammonia. As will be brought out more clearly later, this volatilisation of ammonia causes most of the loss of nitrogen that takes place in making dung.

The ammonium carbonate is itself subject to change and even to loss by other actions than evaporation ; there are always present in the manure heap various bacteria which can oxidise ammonia into free nitrogen gas and water ; in consequence dung which is allowed to lie about loosely grows poorer in nitrogen from this cause as well as through volatilisation of ammonia. This process by which gaseous nitrogen is set free is often called "denitrification," a term better restricted to the change whereby nitrates are reduced to nitrogen gas. The conditions favourable to this change have not been closely investigated ; it is, however, certain that rapid oxidation, such as is brought about by a loose condition of the manure or by turning it, will be accompanied by some destruction of ammonia. It is also favoured by the presence of soluble carbohydrate, *i.e.*, easily oxidisable material, and it is materially reduced, if not suspended, as soon as these substances have been used up.

Another group of bacteria which are extremely abundant in fresh faeces are the so-called putrefactive bacteria which break down the proteids into simpler compounds, such as amino-acids, amides and finally ammonia. Without discussing them individually, their function is to convert the insoluble nitrogenous bodies of the straw (those of the faeces are more difficult of attack because they have already resisted the actions of digestion) into soluble bodies akin to ammonia and therefore more nearly available by the plant. Thus, with a certain amount of loss as free nitrogen, the trend of the bacterial actions taking place in the fresh farmyard manure is to break down the complex insoluble compounds of nitrogen to more and more simple ones, ammonia being the final term. At the same time there is always a reverse change going on ;

as the bacteria themselves multiply they seize upon the active soluble forms of nitrogen and convert them into insoluble proteins in their body tissues. Which action is predominant will depend on the stage that has been reached in the dung-making process, *i.e.*, on the supply of carbohydrate, air, water, and other variable factors, but after the first rapid production of ammonium compounds the longer the dung is stored the more the ammonia returns to a protein form.

So far we have been considering only changes in the nitrogenous material of the excreta and the litter, since nitrogen is the chief fertilising constituent of the manure, but the most characteristic change in dung-making is the destruction of the straw and its conversion into dark brown "humus," which in the end retains none of the structure of the original straw. There are a number of organisms to be found commonly in the air and dust which readily attack such carbohydrate material as straw affords, and in the presence of oxygen burn it up completely into carbon dioxide, water, and inorganic ash. Such organisms, however, do not play a very large part in manure-making, because air soon gets excluded from the mass, and the work is taken up instead by other bacteria capable of acting in the absence of oxygen. Two of these only have been as yet studied with any detail; they both rapidly attack carbohydrates like cellulose and give rise to carbon dioxide, marsh gas or hydrogen respectively, certain fatty acids of which butyric is the chief, and the indefinite brown acid substance known as "humus," which is richer in carbon than the original carbohydrate.

A considerable proportion, amounting to one-quarter or more, of the dry matter of the original dung is lost during this process of humification, by the conversion of carbohydrates into carbon dioxide, marsh gas or hydrogen, and water. The various acids which are also produced are neutralised by the liquid part of the manure, which is alkaline from the presence of ammonium and potassium carbonates, resulting from the fermentation of the nitrogenous constituents and salts of the urine; the dark brown liquid to be seen draining from a dunghill is a solution of the humus formed in this alkaline liquid.

The changes going on during the making and storage of

farmyard manure are thus exceedingly complex ; it is in the early stages that the bacterial actions are most rapid, and they fall chiefly upon the soluble nitrogenous compounds like urea. At this time the greatest losses of nitrogen take place, both by volatilisation of ammonia and evolution of nitrogen gas, and so active is the oxidation that the temperature of the mass rises continually. If the rate of oxidation be promoted by occasionally turning over the mass, as in preparing a hot bed or a mushroom heap, the rise in temperature is much increased, at the same time the losses of nitrogen rise rapidly and the amides and ammonium carbonate disappear more quickly. What the gardener calls " taking the fire " out of the manure means so reducing the free ammonia that the material is no longer injurious to a plant's roots, though it still remains rich in nitrogen and organic matter capable of further decay. As soon as the first violent reactions are over, especially as the mass becomes consolidated by trampling and the oxygen in the entangled air used up, the rate of change slows down considerably ; it now consists mainly in the attack of the anaerobic organisms upon the carbohydrate material. The long strawy dung begins to change to " short " or rotten manure, and this change may continue slowly for years, until all trace of structure is entirely gone and only a brown pulp is left. During this second change but little loss is experienced by the nitrogenous compounds if the mass be kept tightly pressed and moist so as to exclude air ; there will be no loss of fertilising constituents, only a gradual decline of weight as some of the carbon compounds are converted into gases. Of course, as the manure gets older and shorter it becomes richer in nitrogen ; this apparent increase is, however, simply due to the loss of non-nitrogenous carbon compounds, so that the nitrogen, which does not waste, always bulks larger and larger in the residue. But though there is no loss in nitrogen in these later stages the more active compounds, such as ammonia and the easily decomposable amides, become converted by bacterial action into compounds which take longer to reach the plant when the manure finally gets in the soil.

One other change sometimes takes place when the manure is allowed to get too loose and dry ; instead of bacteria, fungi begin to develop very rapidly and the whole mass becomes

permeated with the mycelium. The masses of manure begin to look white and dusty, a condition which the practical man describes as "fire fanged." It is generally agreed that such manure is seriously deteriorated, but no analyses are available.

With these general facts in mind it will be possible to interpret the experiments which have been made on this subject. In the first place it can be shown that there is no loss of nitrogen in the gaseous form due to the animal, the nitrogen contained in the urine and faeces is equal to the nitrogen in the food, less whatever may have been retained by the animal in its bodily increase. Numerous feeding experiments have demonstrated this point.

Assuming the animal itself to cause no loss of nitrogen other than that retained in the increased live weight, a number of experiments have been made to ascertain the losses under ordinary working conditions of making farmyard manure.

For example, Maercker and Schneidewind at Leuchstadt, Saxony, in 1896-97 tied up twenty-four three-year-old steers from 16th June to 29th October, 1896, 136 days, during which their average increase of live weight was 306 lb. The food consisted of lucerne hay, chaff, barley straw, dried sugar beet pulp, decorticated cotton-cake, and bran, and they were littered with wheat straw.

Twelve of the beasts were tied up in a deep, carefully cemented box or pit, from which no losses by drainage could take place, and the dung was not disturbed but kept trampled down until the end of the trial. The second twelve were fed in an ordinary stall, and the dung and litter were removed every other day to one or other of two heaps in the yard alternately, one of these being covered by a roof and the other open to the weather. At the end of the feeding experiment the three lots of dung were carefully sampled and analysed, with the results set out in Table II below.

In a second experiment fourteen steers were fed in the deep pit from 6th November, 1896, to 21st February, 1897, when the dung made was cleared out, sampled and analysed. The experiment was then resumed until 21st May, after which the dung was left in the box for another month until 17th to 18th June, without any beasts to keep it trodden down, the weather being meantime very hot. The results appear under 4 and 5

in Table II. It will be seen from this that the loss of nitrogen was much greater during the second period, which only differed from the first in the fact that the dung lay without trampling for a month during the summer.

TABLE II.—Loss of Nitrogen in Making and Storing Dung
(Maercker and Schneidewind).

No.	Conditions under which Manure was made.	Nitrogen Supplied.		Nitrogen Recovered.	
		In Food.	In Litter.	In Meat.	In Dung.
FIRST EXPERIMENT.					
1	Deep box	1,033	68·0	64·3	900
2	Covered heap	1,033	68·0	68·0	652
3	Open heap	1,033	68·0	68·0	646
SECOND EXPERIMENT.					
4	Deep box	922	52·1	54·6	797
5	„ dung lying one month untrampled ...	953	65·4	45·9	634

No.	Conditions under which Manure was made.	Nitrogen of Food.			Active Nitrogen Recovered.	
		Recovered—		Lost.	Calculated.	
		In Meat.	In Dung.		Calculated.	Found.
FIRST EXPERIMENT.						
1	Deep box	6·2	80·6	13·2	70	28·5
2	Covered heap	6·6	56·5	36·9	70	18·0
3	Open heap	6·6	56·0	37·4	70	13·0
SECOND EXPERIMENT.						
4	Deep box	6·0	80·8	13·2	—	—
5	„ dung lying one month untrampled ...	4·8	59·7	35·5	—	—

Taking these results as a whole it is seen that even with the most careful management the loss in making the dung amounts to 13 per cent. of the total nitrogen supplied in the food, in addition to 6 per cent. or so which the animals retain. This

loss increases with great rapidity if the conditions be less favourable; the minimum is only attained if the dung be kept trampled beneath the animals in a deep box, for if it be left to itself for a time, or if it be made in a shallow stall and thrown out daily into a heap, as is sometimes the practice, the loss rises to between 30 and 40 per cent.

In connection with the first-mentioned experiment, Maercker and Schneidewind made determinations of the state in which the nitrogen exists in the dung, whether it was soluble and therefore active, or insoluble and comparatively inactive. From the known digestibility of the foods consumed it was possible to calculate what proportion of the nitrogen in each food left the body in a digested condition as urea and kindred bodies dissolved in the urine, and what proportion consisted of undigested and insoluble compounds in the faeces. Maercker and Schneidewind found not only that the loss had fallen upon

TABLE III.—Loss of Nitrogen in Making and Storing Dung
(Muntz and Girard).

	Nitrogen.				For 100N. in Food.		
	In Food and Litter.	In Meat or Milk.	In Dung.	Lost.	Recovered—		Lost.
					In Meat or Milk.	In Dung.	
1.—Horses in stalls	...	52·4	—	39·9	12·6	—	71·3 28·7
2.—2 cows in boxes	...	14·1	2·8	7·5	3·9	20·0	52·7 27·2
3.—8 "	...	79·5	10·7	41·7	27·0	14·4	49·3 36·3
4.—8 "	...	96·6	17·7	50·1	28·8	19·7	48·3 31·9
5.—8 " and 2 beasts in boxes	...	98·8	15·8	49·4	33·5	16·6	48·2 35·2
6.—25 fattening sheep under cover	14·7	0·9	6·5	7·3	6·2	43·6	50·2
7.—25 "	23·1	1·4	9·0	12·7	6·0	38·7	55·3
8.—20 "	14·4	1·4	6·4	6·6	9·9	44·2	45·9
9.—20 "	14·6	0·2	8·0	6·3	1·7	54·5	43·8
10.—20 "	10·5	0·6	5·3	4·6	5·5	50·2	44·3
11.—Fattening lambs	...	98·0	10·0	35·4	52·5	10·6	34·1 55·3

No. 1.—Littered on straw, dung removed every day.

No. 2.—No litter, urine drained off, dung removed several times a day.

Nos. 3, 4 and 5.—On litter, dung removed once or twice a week.

Nos. 6 to 11.—On litter, dung only removed at end of experiment.

the active nitrogen, *i.e.*, that urea had been transformed into ammonium carbonate and volatilised or broken up with loss of free nitrogen, but also that some of the active nitrogen had been converted into an insoluble form, as though the bacteria swarming in the dung had seized upon the active nitrogen and converted it into the insoluble material of their own substance. Of course, this withdrawal of nitrogen from the active into the insoluble form still further reduces the value of the dung as a whole.

In France, experiments were carried out on the same question by MM. Muntz and Girard with omnibus horses, cows and sheep ; they showed that with horses and milking cows, where the manure was removed every day, the loss of nitrogen amounted to from 30 to 35 per cent. of the total nitrogen contained in the food. With sheep the losses were still higher. Liberal littering and immediate treading of the excreta into it by the animal greatly reduced this loss. The results are given in Table III. It is apparent that on the whole the proportion of the nitrogen recovered in the manure is about one-half of that supplied in the food.

Experiments of the same kind have also been carried out on the farm of the Royal Agricultural Society at Woburn for some years, and the results obtained in 1899, 1900 and 1901 are given in Table IV. The animals were fed in deep boxes with cemented bottoms and sides and the dung was not removed until the feeding experiment had concluded ; it was then weighed and samples taken for analysis. The manure was then in the early winter made up in a heap in the open on ground beaten down hard and covered thoroughly with earth. No liquid appeared to drain away, and in the spring the heap was again weighed and sampled before application to the land for the root crop. Here again the loss of nitrogen in making the dung under the best conditions varied from 13 to 18 per cent., while the making into a heap and storage brought up the loss to 33-37 per cent.

Wood at Cambridge has also estimated the losses involved during the making and storage of farmyard manure. In his experiments four heifers were tied up and fed, one pair on mangels, hay, and straw alone, the other pair on the same foods with the addition of decorticated cotton cake. The feeding went on for eighty-four days in boxes with well rammed clay

floors, the dung not being disturbed but kept trampled down by the animals; this is taken as the period of "making" the dung, and at the end samples were drawn by cutting out sections. The dung was now left without moving for six months, May to November, and again sampled as it was taken out—this constitutes the storage period. Table V shows the fate of 100 lb. of dry matter and nitrogen respectively fed to the animals.

TABLE IV.—Loss of Nitrogen in making and storing Farmyard Manure produced by Consumption of Foods by Fattening Bullocks, 1899, 1900 and 1901. (Woburn.)

LOT I.

	Manure as removed from Boxes.			Manure as applied (after Storing) to Land.		
	1899.	1900.	1901.	1899.	1900.	1901.
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
Total nitrogen estimated to be in manure, as calculated from foods consumed after deducting live-weight increase (Lawes and Gilbert)	34·23	32·39	29·87	34·23	32·39	29·87
Total nitrogen actually found in manure	29·81	26·47	24·96	21·30	20·92	19·84
Loss of nitrogen	4·42	5·92	4·91	12·93	11·47	10·03
Percentage loss of total nitrogen	12·90	18·28	16·44	37·70	35·50	33·60

LOT II.

	Manure as removed from Boxes.			Manure as applied (after Storing) to Land.		
	1899.	1900.	1901.	1899.	1900.	1901.
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
Total nitrogen estimated to be in manure, as calculated from foods consumed after deducting live-weight increase (Lawes and Gilbert)	34·23	32·39	29·87	34·23	32·39	29·87
Total nitrogen actually found in manure	32·07	26·66	24·67	22·53	22·78	20·39
Loss of nitrogen... ...	2·16	5·73	5·20	11·70	9·61	9·48
Percentage loss of total nitrogen	6·30	17·69	17·41	34·18	29·70	31·80

TABLE V.—Dry Matter and Nitrogen fed to animals.

	Retained by Animal.	Lost.		Recovered in Dung.	
		During Making.	During Storage.	When Made.	After Storage.
Dry matter—		Per cent.	Per cent.	Per cent.	Per cent.
Roots and hay only ...	2·6	38·8	16·2	58·6	42·4
Roots and hay with cake ...	5·0	35·0	18·6	60·0	41·4
Nitrogen—					
Roots and hay only ...	8·0	16·8	10·6	75·2	64·6
Roots and hay with cake ...	9·0	12·5	26·9	78·5	51·6

In an experiment made by Russell and Goodwin at the Wye Agricultural College the beasts were fed upon roots, hay, and linseed cake, a comparison being made between linseed cake poor and rich in oil respectively. The feeding lasted for twelve weeks, and the litter was composed of a bottom layer of peat moss to which straw was added at the rate of 28 lb. per week. Table VI shows the results obtained.

TABLE VI.

	Nitrogen Supplied in Food.			Nitrogen Recovered.			Nitrogen Lost.	
	Digestible.	Un-digestible.	In Litter.	In Meat.	In Dung : Ammonia, &c.	In Dung : Slowly Available.	Actual.	Per cent.
1. Cake poor in oil ...	Lb.	Lb.	Lb.	Lb.	I.b.	Lb.	Lb.	14·9
2. Cake rich in oil ...	43·83	11·77	4·35	3·07	28·6	20·9	7·38	14·4
	33·29	10·19	4·35	2·04	22·1	16·9	6·69	

The dung was sampled immediately the experiment was over, while the manure was still tight under the feet of the animals ; the experiment also took place during the winter months, yet the loss still amounted to nearly 15 per cent. of the total nitrogen. It is noteworthy that all the experiments quoted show practically this same loss of 15 per cent. for the first stage of the dung-making process under the best conditions. Not only

does the loss fall upon the active compounds of nitrogen, but part of them is also converted into much more slowly acting bodies. For example, in the last quoted experiment there were 43·83 lb. of digestible nitrogen fed, of which the animal only retained 3·07 ; the remainder, 40·76 lb., was excreted as urea, but only 28·6 lb. of ammoniacal and amide nitrogen were found in the dung, so that besides the loss of 7·38 lb. another 4·78 lb. had been transformed into proteins and other insoluble compounds.

It will be seen that in all cases the losses fall most heavily on the rich dung made by animals receiving concentrated foods ; they also fall almost entirely on the most valuable part of the manure—the urea and ammonia compounds arising from the digestible portions of the food. It is also clear that these losses are avoided when the food is consumed upon the land, as by sheep folded on the arable, milch cows grazing, or beasts fattened with cake upon the summer grass.

Of course, in all these considerations no account has been taken of such preventible losses as those which too often occur because of the escape of the liquid portions of the manure through a leaky yard or into the drains or by the washing of rain through the dung heap. Such losses are very great and fall on the most valuable substances in the manure, the soluble ammonia and potash compounds which occur in the liquid portion.

In order to minimise these losses of nitrogen a number of substances have been suggested which when strewn about the cattle stalls and mixed with the fresh dung would either combine with the ammonia and prevent its volatilisation, or by reducing the bacterial actions, would hinder its formation. These preservatives fall into two classes : those designed merely to fix the ammonia, and the true antiseptics which will check the production of either ammonia or free nitrogen gas.

Of the first class of substances the oldest proposal was to use gypsum, which would react with the ammonium carbonate and form the non-volatile ammonium sulphate. The drawback to the use of gypsum lies in the large quantities that are required ; owing to the reversible nature of the change and the insolubility of the gypsum, a great excess of gypsum would be necessary in practice—about $\frac{1}{2}$ cwt. of

gypsum, costing 1s., for each ton of farmyard manure made. Besides the question of cost, another great drawback to the use of gypsum lies in the fact that the calcium sulphate is itself liable to bacterial change ; during the storage of the dung it is reduced by anaerobic bacteria to the state of calcium sulphide, which afterwards acts injuriously on plant life when the farmyard manure is applied to the soil.

Another suggestion has been to use kainit, because it is composed of salts of magnesium and potassium which will to a certain extent be transformed into carbonates and fix the ammonia as chloride or sulphate. Here again the quantity required is very large, though the soluble nature of the kainit enables it to be utilised more thoroughly. But of this class of substances the most effective is superphosphate ; the acid calcium phosphate it contains reacts with the ammonium carbonate to form a double ammonium calcium salt, insoluble indeed, but very readily available for the plant. The same objections, however, apply to superphosphate as to gypsum ; uneconomical quantities are required if the fixation of the ammonia is to be complete, the superphosphate itself contains gypsum which becomes reduced to the injurious calcium sulphide, and again the acid superphosphate is found to be harmful to the feet of the animals treading down the litter among which it is strewn.

Sulphuric acid itself has been tried, as also peat moss impregnated with small quantities of the same acid, but neither have proved successful for the reasons indicated above.

As to antiseptics proper, soluble fluorides and even carbon bisulphide have been tried, but the saving effected in the nitrogen is never sufficient to pay for the cost of the material and the trouble of applying it. Schneidewind in the course of his experiments at Leuchstadt found that the only practical means of reducing the losses of nitrogen was to place a layer of old well rotted farmyard manure as a basis for the new manure heap ; this had a distinctly beneficial effect and always resulted in smaller losses of nitrogen, possibly because of the constant evolution of carbonic acid from the layer of old manure.

PRUNING FRUIT TREES.

WALTER P. WRIGHT.

II. ESTABLISHED TREES.

In the first paper on pruning* the subject was considered in its first and most important aspect, that of so manipulating young trees as to prevent the necessity for laborious and costly pruning operations in the future, the point being that the only true economy is to shape the trees at a stage when a few strokes of the knife suffice. We may now proceed to consider the method of dealing with developed trees, but it cannot, unfortunately, be assumed that every grower is in the happy position of having trees under his care which were properly attended to while young. A great many have inherited a legacy of mismanaged trees. The task of dealing with the latter is more difficult, but, except in rare cases, not absolutely impossible. The principal fruits will be taken separately.

APPLES.—Inasmuch as different sorts of apples vary in character, a rule of pruning entirely free from exceptions cannot be laid down; but the great majority of the varieties correspond closely enough to each other for the apple to be classed as a spur bearer. The young wood bearers, such as Lady Sudeley, Irish Peach, and Cornish Gilliflower, are few in number and hardly of the first order of merit. The routine pruning of the apple may differ slightly from that of a pronounced spur-bearer, such as the pear, in that young wood, if well ripened, will frequently form fruit buds along the greater part of its length. Generally speaking, breast-wood should be kept down, but where there is room a young shoot may be allowed to extend, and, in its second year, it will probably fruit.

If the main branches of most apples are kept thin—say a foot apart at a yard from their base—they will, as they mature, form spurs, which will break into leaf and blossom in spring. The wood shoots developing from them may be summer pruned and cut back close to their base at the winter pruning. Any side shoots other than those from spurs may be treated in the same way.

Summer Pruning.—Summer pruning is of great advantage to the apple, as indeed it is to all spur-bearing fruits. One

* *Journal of the Board of Agriculture*, Vol. XIV, p. 705, March, 1908.

valuable end that it serves is the prevention of over-crowding. Vigorous varieties growing in rich soil make an immense amount of breast-wood, and if the whole of it is allowed to develop unchecked the trees become crowded with foliage. It is very difficult to see what benefit this is to the trees,

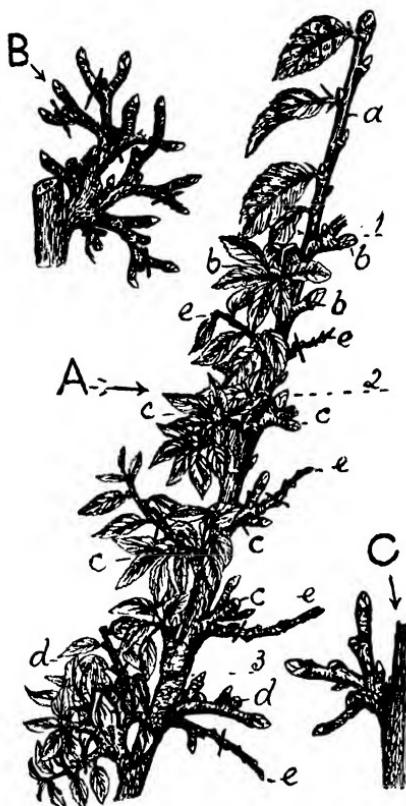


FIG. 1.—Pruning apple-spurs:—(A), portion of a branch: (a), extension growth terminated by a blossom bud (as common with Irish Peach, Lady Sudeley and Golden Noble); (b), one-year spurs with blossom buds; (c), two years spurs; (d), three years spur; (e), spur growths pinched to three leaves in summer and shortened in winter to the cross lines. (B), closely branched spur marked for thinning. (C), spur with long stragglers cut off, thus keeping the spurs close to the branch.

considered as fruit producers. Of course, a certain amount of leafage is necessary in order to maintain healthy root action and a sufficient flow of sap; but it will hardly be suggested that more is necessary or beneficial than can have exposure to light and air. In this matter the apple grower should

learn to exercise the same sound judgment as the successful grape grower, who maintains a sufficient spread of foliage to cover the glass, but takes care to suppress all shoots which cannot have exposure to light.

Growers sometimes remark, in reference to summer pruning, that they cannot find time for any work that is not absolutely necessary. There is no doubt that summer pruning would be much more commonly practised than it is, were it not for the fact that at the period when it calls for attention urgent work, such as picking, is in hand ; but we have here to consider summer pruning on its merits rather than in relation to its expediency ; and, after all, it is not a long operation. A practised hand will speedily deal with a considerable number of trees.

The best period for summer pruning will depend partly on the season, partly on the soil, and partly on the varieties. Unless the trees threaten to become very thick it is not wise to do it before the end of July, because, if done earlier, the object in view may be defeated by the outbreak of a mass of sub-laterals. The latter could be stopped again, but that greatly increases the labour. However, in the case of sorts which make a great deal of breast-wood, earlier pruning is desirable, even if it entails stopping again. Most varieties of apples make their principal growth in June and July. August and September should be months of ripening—of maturation ; and the latter process is greatly helped if sun and air can have free access to all parts of the tree.

Most summer pruners nip or cut off the ends of the shoots from the sixth leaf, that is, they count six leaves from the base and then stop the shoot. Others prefer merely to break over the shoot, on the ground that the partial check to the sap flow serves the purpose in view without so much danger of back breaks. This argument is quite sound, but trees so treated have an untidy appearance, which, in private gardens at all events, is considered objectionable.

Winter Pruning.—Trees that have been summer pruned may have their winter pruning at any time from November to March inclusive. There is so little to be said in favour of one month over another that the grower may be advised to get the work done at the period which is most expedient. Of the two

great winter operations in the fruit garden, digging and pruning, the former is the more dependent on the weather, and should

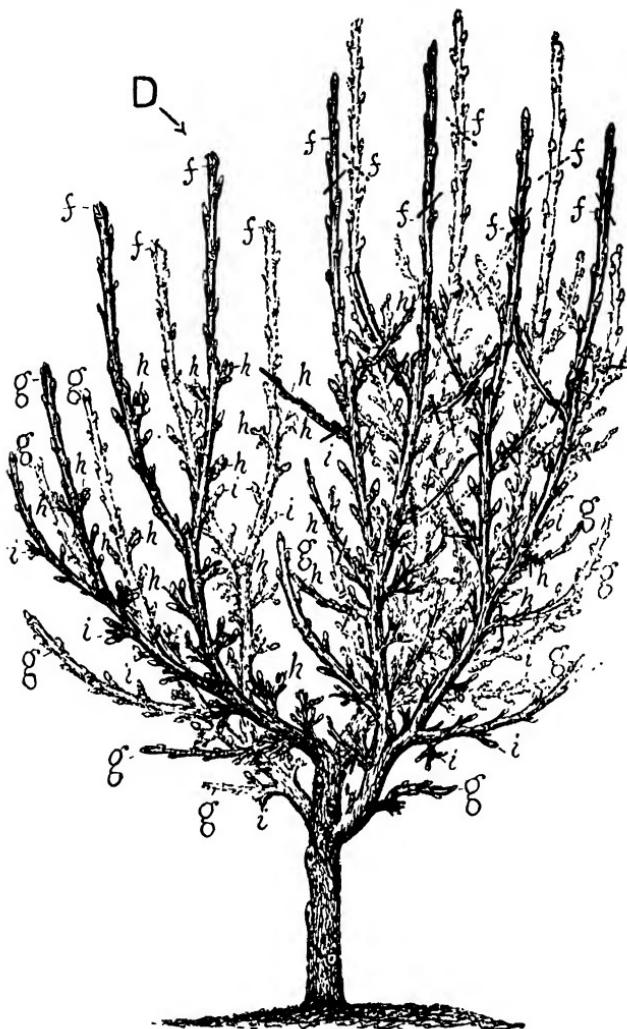


FIG. 2.—Pruning apples :—(D), young wood tree. Left hand side of tree after pruning, back branches shown in dotted outline for clearness. Right hand side of tree unpruned, but marked for shortening by cross lines: (f), extension growths shortened, or marked for it by cross lines, in order to induce buds to start on the whole length of the previous year's wood; (g), short extensions to be left intact; (h), shoots summer pinched and shortened to two "eyes" at the winter pruning; (i), spurs.

therefore have the first claim. It is dangerous to defer digging until spring, because bad weather may then cause serious delay ; but there is no harm in deferring pruning.

We may summarize the pruning of the apple as follows :—

(1) With the exception of a few, the varieties are spur and ripe wood bearers.

(2) The best type of tree is an open bush with about a dozen main branches growing upwards and outwards, well clear of each other.

(3) Leading shoots should not be severely curbed, but allowed moderate extension.

(4) Breast-wood may be summer pruned at the sixth leaf.

(5) Winter pruning may be done from November to March inclusive, and the shoots may be cut back to about an inch.

(6) In pruning, extension shoots should be cut close to an outside bud.

(7) In case of great luxuriance of growth, accompanied by non-flowering, the roots should be pruned. The roots half-way round the tree may be done first, and, if that does not suffice, the circle may be completed the following winter.

APRICOTS.—These are almost exclusively grown on walls. They must be shortened when young to secure a framework on somewhat the same line as peaches.* As the wood matures it will form fruiting spurs naturally, but it will also form shoots intermediate in character between spurs and breast-wood, which are termed by gardeners “stubs.” If quite short they may be left untouched ; if they run to six or eight inches long they may be stopped. In both cases they will form fruit buds near the base. The breast-wood must be kept under control. Where there is room a few of the best placed of the summer shoots may be tied in, but the majority should be summer pruned and then spurred in during winter.

CERASUS.—Heart or Bigarreau Cherries are spur-bearers ; the Morello is a young wood-bearer. Heart Cherries should require very little pruning ; indeed, it is an advantage if the knife can be kept away from them altogether, because pruning is frequently followed by an exudation of gum. If care is taken in shaping the trees while young, and the soil is not very rich but well impregnated with lime, the trees rarely become crowded. Should they threaten to become thick in leaf, as, owing to the free distribution and vigorous circula-

* See “The Pruning of the Peach,” *Journal*, Vol. XIV, p. 661, February, 1908.

tion of the sap, gumming is not so liable to take place as is the case in winter. With the main branches thinly disposed,

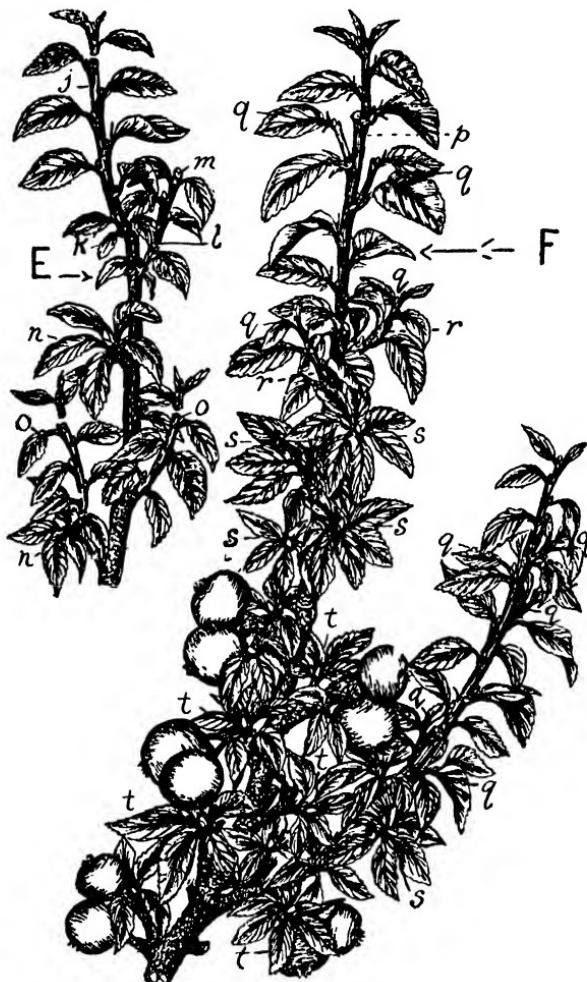


FIG. 3.—Summer pruning apple shoots:—(E), portion of branch with characteristic growths: (j), extension growth pinched at the sixth good leaf, not counting small basal leaves (k); (l), side growth not extending more than five or six leaves and terminated by a bold bud (m), generally a blossom bud; (n), spurs (a short stubby growth, the leaves disposed in a corona, with a prominent bud in the centre); (o), growing side shoots pinched at the third good leaf. (F), portion of branch in bearing: (p), extension; (q), laterals (not to be pinched unless extending beyond three leaves); (r), side growing shoots pinched; (s), one year spurs; (t), two years spurs.

the trees will form fruit spurs freely and make comparatively little breast-wood. Morello Cherries must be treated like peaches. The early shortening of the trees may be the same,

and the routine pruning may be identical ; that is, the fruiting shoots may be cut out after the crop has been gathered and young shoots tied-in in their places. Those who do not object to the somewhat straggly and untidy appearance of naturally grown trees may leave them unpruned altogether. They look very pretty when in flower, and they bear heavy crops of fruit.

COBNUTS AND FILBERTS.—Growers of nuts learn that there are two distinct forms of inflorescence on the same tree—the catkin or male flower, and the fruiter or female. Both are borne on the wood made the previous year. The same lesson may be learned by an examination, in spring, of a hedgerow hazel. The nut is therefore a young-wood bearer ; but a framework is necessary to carry the fruiting wood, and this may take the form of a basin-shaped bush with an open centre. It is easily secured by early shortening and selection. The raiser must guard against crowding the centre of his trees. So long as he is careful in this respect the rest will come.

Nuts are best pruned last of the various fruits, especially by those who are not thoroughly familiar with them, otherwise the fruiting wood may be cut away. There is no difficulty in identifying the different flowers. The catkin is long, tapering, and brownish-yellow in colour. The female is pink, and breaks like a little rosette from the tops of the plump fruit buds. The side shoots on the older wood should be examined in turn. Some may be natural spurs, with a wood bud at the tip and a fruit bud at the base ; these may be left unshortened. Others (and these the majority) will be shoots several inches long, with fruit buds and catkins. These shoots may be pruned to a catkin a few inches from the base. Old fruited wood may be cut out.

PEARS.—The pear is a spur-bearer pure and simple. It is true that cases are met with of fruit forming on young wood, and the writer has seen a shoot of the current year's growth so well set with flower buds that it bore a heavy crop the following season ; but such events are entirely exceptional and may be left quite out of account in cultural routine. An established pear tree, growing in good soil, with its main branches standing well clear of each other, is very easy to prune, because its fruiting system is well defined. It will form spurs on the matured wood and a considerable amount of breast-

wood, which, however, is not likely to be very coarse. Summer pruning is good and may be practised as for apples, but it is not, as a rule, so essential as with apples, because the risk of over-crowding is less. With or without summer pruning there must be winter pruning, the young wood being cut in close to the main stem or spur as the case may be.

After many years of pruning, the spurs on wall pears sometimes increase in size to such a degree as to become both weak and unsightly. They may be crowded with fruit buds,



PEAR TREE, HORIZONTALLY TRAINED.

(*a*), stock; (*b*), point of budding or grafting; (*c*), scion or variety of pear; (*d*), point of heading maiden tree; (*e*), point of second shortening; (*f*), point of third (prospective) cutting back; (*g*), leading or stem growth with laterals (*h*) pinched; (*i*), side branches (prospective); (*j*), one year side shoots or branches; (*k*), laterals pinched; (*l*), laterals marked for shortening; (*m*), spurs with blossom buds; (*n*), short shoot with bold bud at the extremity, generally a blossom bud (not to be shortened). One side of the tree is shown in leaf and the other side bare.

but these are small and do not yield good fruit. In such a case the spurs may be reduced in size with great advantage.

PLUMS.—Well trained plum trees are very easy to prune, because when once they have developed a fruiting habit they do not make any great amount of wood. The summer shoots are generally limited, both in number and size. Thus, it is rarely necessary to summer-prune them. The breast-wood may be spurred back in winter similarly to pears. Fruiting spurs will form on the matured growth. There will also, in healthy trees, be a considerable number of "stubs," which, in

the main, may be left untouched, but may be stopped if they become elongated.

Damsons may be treated similarly to plums, but require very little pruning when once shaped and established.

GOOSEBERRIES AND CURRENTS.—Gooseberries may be pruned in the main on the spur system, and thrive under the same management as apples. Trees with from eight to ten branches quite clear of each other, the breast-wood of which is summer pruned, and winter (or preferably spring) spurred, give heavy crops of fruit, which may be gathered rapidly and painlessly. Where there is room for a few sturdy, well matured young shoots they may be allowed to remain. The best way of pruning an old crowded bush is to cut out some of the central branches from below, thus opening up the middle of the bush. The side branches can then be thinned.

Red currants are spur-bearers pure and simple, and may be pruned like pears. Black currants are young-wood bearers and must not be summer pruned or spurred. The pruning must be restricted to cutting out old fruited wood.

THE SUPPOSED DEGENERACY OF THE POTATO.*

SIR W. T. THISELTON-DYER, K.C.M.G., F.R.S.

The undoubtedly difficulties which now occur in the cultivation of at any rate some kinds of potatoes present a problem which is obviously of great practical importance as well as of scientific interest. It is not, however, satisfactorily disposed of when attributed to degeneracy. The potato plant has not been run out, but too much has been demanded of it, and it has broken down in the attempt to respond. I think a little further light may be thrown on the subject by examining rather more closely what happens in a potato under natural and healthy conditions.

A potato tuber is an underground branch which, towards the end of the growing season, becomes swollen out laterally and filled with accumulated nutriment for the purpose of giving its buds a vigorous start in the following year. This nutriment is stored up for the most part in the form of starch. Now this is insoluble and is not available to support growth till it has

* See "Degeneration in Potatoes," *Journal*, Vol. XIV, p. 385, Oct., 1907.

been converted into something—a sugar—which is soluble. This conversion is effected by a ferment or *enzyme* called *diastase*. It can be extracted from the potato tuber and it will do its work quite as effectively outside as inside ; it has been found, however, that if an extract be made from an ordinary healthy potato it has, at first, no action on starch ; but, after standing for a few days, attacks it energetically. (Vines, *Physiology of Plants*, p. 192.)

The explanation is that diastase is not present as such in a potato tuber but is the result of the decomposition of another substance called a *zymogen*, a word which merely means “ ferment producer.” Before the starch in a potato tuber can be made available to support growth two things have to take place : (1) Decomposition of the zymogen to produce diastase ; (2) conversion of the starch into sugar by its action. Until they do take place there will be no growth from the tuber.

When, therefore, a tuber fails to grow it is not a sufficient explanation of the failure to say that the plant is degenerate, or that diastase is wanting. Both explanations are conclusively disproved by the interesting experiment of the Curator of Kew in exposing the sluggish tubers to a higher temperature. They then sprouted vigorously, and, after planting, produced a normal crop. It is clear that what was really amiss was that the diastase remained locked up in the zymogen and was not available to do its work. It is known that the production of diastase requires the access of oxygen from the air ; it also needs some amount of warmth and is probably stimulated by light.

When a sluggish tuber is planted, it either remains completely dormant or sends up a feeble growth which utilises little of the accumulated starch. On the other hand, the shoot manufactures more, and this is transferred to the tuber which actually increases in size. What is now complained of seems to be only an extreme form of a state of things which has long been known to cultivators. In Gloucestershire the remedy recommended is “ greening ” the tubers. The method is described in Leaflet No. 173, pp. 4, 5, issued by the Board. The tubers “ are placed in the autumn in shallow boxes containing no soil or other material, and stored throughout the winter in tiers in a cool, well-ventilated and well-

lighted shed." Under the influence of light the dormant surface of the tuber becomes active and green. This means that chemical action takes place ; diastase will be set free, starch will be made available for growth, and sprouting follows. It was found in Yorkshire in 1903 that with Up-to-Date, "an advantage of 2 tons per acre followed the use of boxed seed."

As far as any general conclusions can be drawn from the facts as stated it can hardly be said that the potato is in any intelligible sense degenerate, but it appears to have become sluggish in starting into growth and to require the stimulus of a higher temperature than formerly. It must be remembered that the modern potato is a highly artificial product. It has been induced by continual selection to load itself with starch to a point far in excess of any natural requirements of the plant. It may be that, as already suggested, too much is demanded of it and that the machinery for the processes of growth has reached its breaking point. The tuber desirable for food may not be one which is prompt to start into growth without increased stimulus from heat and light. We can control nature in altering the constitution of a plant ; but eventually a barrier is reached beyond which it is impossible to go. The case of the sugar-beet is instructive. Beginning with 8 to 10 per cent. of its weight of sugar, it has been brought up by selection to 16 to 18 per cent. But H. L. de Vilmorin informed me this was the limit. "Beet-roots containing more than 18 per cent. sugar cease to vegetate properly and die." (*Kew Bulletin*, 1897, p. 317.) If a similar limit has been reached in the potato, growers must be content with sturdier but perhaps from a culinary point of view less desirable kinds.

INSURANCE OF LIVE STOCK.

The mutual insurance of live stock is a form of co-operation which has been successfully adopted among cottagers and allotment holders in different parts of this country. In Lincolnshire, in particular, cow and pig clubs are numerous, and they are not uncommon elsewhere. No complete returns are available as to their number, but in 1905 the Board ascertained the existence of 1,021 pig-clubs in England. From particulars published by the Board of Trade (*Labour*

Gazette, December, 1907) it appears that only 58 of these insurance societies were registered under the Friendly Societies Act in 1906. These had a membership of 3,718, or about 64 to each society. The members' contributions during the year amounted to £1,758 and the compensation paid to about the same sum. The funds in hand at the end of the year were £7,899, or about £136 for each society. From an account of the cow and pig clubs in Lincolnshire given in this *Journal* in May, 1905, it seems that the subscription to the society is usually a fixed amount, such as 6s. per head per annum in the case of cows regardless of value, and this sum together with entrance fees is found sufficient to pay compensation at the rate of 75 per cent. and to accumulate a reserve fund. The average number of deaths during the year is about 3 per cent. In the case of pig clubs about 1d. a week per pig is usually paid, but an extra charge is made for breeding sows while sucking pigs are not insured. The compensation paid varies from three-fourths to the full value. The societies are formed for and rely entirely on mutual help, though their income is frequently augmented to a small extent by subscriptions from honorary members.

The extension in the provision of allotments and small holdings in England, which is likely to take place in the near future, will make the establishment of societies of this type of still greater importance, and it is to be hoped that this simple and effective form of co-operation, which is well known and understood in the rural districts of England, will be largely adopted.

It may be of some assistance in this connection to give a brief description of the methods which have been successfully adopted abroad.

The system of co-operative insurance of live stock against losses by death or compulsory slaughter exists in almost every Continental country, and in many it is very widespread. The methods adopted, however, vary very materially. In some countries, such as Holland, insurance societies have grown up without official intervention or State aid; elsewhere, as in France, for example, mutual insurance has only gained ground since the State began to foster and encourage its development. In Germany, again, local insurance associations have not been found adequate to meet the requirements of owners of live

stock, and in order to meet the disadvantages of small independent groups they have been affiliated to a central organisation in such a way that part of the risk is borne by the local society and the remainder by the whole organisation. Whatever method may have appeared most suitable to the special circumstances of the community concerned, the attempt to protect owners against the unexpected losses occasioned by the death of their cattle appears to have met with considerable success. In almost all cases, however, these insurance societies are recruited from among the smaller farmers, to whom the advantages offered naturally appeal with the greatest force.

HOLLAND.*

The insurance of live stock in Holland has been very generally adopted in the districts where small breeders predominate, and although attempts to centralise them have been made at different times these have not met with any success. The advantages of the local over the central type are held to consist in its inexpensive administration, which is usually quite honorary, and in the control which members can exercise over each other when the operations are limited to a small area.

The following table, taken from the Report of the Ministry of Agriculture for 1906, shows the extent of the operations of the associations :—

—	No. of Societies.	No. of Members.	No. of Animals Insured.	Percentage of Animals Lost during 1906.
Horses	377	30,447	56,814	3·0
Cattle	748	72,797	273,099	1·9
Pigs	56	4,357	9,096	6·0
Sheep and goats ...	55	3,857	6,362	7·7

It will be seen that the number of horses insured is less than two, and of cattle less than four, per member.

As has been stated, the societies are usually confined to a very limited district, such as a few adjacent villages or communes ; it is thus possible not only for all the members to know each other, but also for the costs of management and administration to be reduced to a minimum. The director or secretary of the society occasionally receives some small remuneration

* Summarized from information supplied by the Netherland Government and forwarded through the Foreign Office.

for his trouble, but usually only his out-of-pocket expenses are paid, and this is also the case with valuers and other officers.

One objection to the small area covered by the society is that in the event of great mortality, such as an epidemic of contagious disease, it may get into difficulties, and many of them do not undertake to pay compensation in such cases. The objections connected with the limited sphere of operation could be removed by re-insurance, but this is rarely done.

Various provisions are made to prevent fraud, and no compensation is paid if the death of the animal is attributable to neglect; most insurance funds also require the participants to insure all their cattle above a certain age, except cattle fattened for slaughter. Only healthy cattle are insured, and many societies oblige the members to consult a veterinary surgeon in case of sickness among the cattle and to give notice to the management. Veterinary aid is not often furnished free, though some associations refund part of the cost. Many associations have the right to take over an insured animal and slaughter it. Further, various provisions are found with respect to the payment of compensation for certain diseases. Thus it frequently happens that no compensation is paid for cows which die of a second or third attack of milk-fever, or for animals which die within a certain time after castration, or for animals which die of anthrax in a meadow where a case of this disease has occurred shortly before.

The societies for different classes of animals are usually distinct.

Horse Insurance.—Most of the local funds only insure horses of one year and upwards, and there is frequently a maximum and minimum value. They are examined and valued for this purpose by a committee, which once a year or oftener visits all the members for the purpose of insuring new horses and re-estimating the value of animals already insured. In some districts the members are bound to bring the animals together at a certain place on specified dates. Sometimes the examination is carried out by a paid expert.

Horses are usually valued at their full market value, and from 70 to 90 per cent. of this is paid as compensation, though some societies only pay 50 and some as much as 95 per cent. In some associations, especially in the provinces of Friesland and

North Brabant, horses are classified according to their value. As a rule a higher percentage is paid for horses in the higher classes than for those in the lower classes, as it has been found that of the animals insured for a low amount more die on an average than those insured for a high amount.

The necessary money is collected by regular premiums on the insured value or by a contribution according to the losses sustained, or by a combination of the two. The premium varies from $1\frac{1}{2}$ to $3\frac{1}{2}$ per cent. of the insured value. There may also be an entrance fee, either a percentage of the value or a fixed sum per animal. No large reserve funds are accumulated ; the societies usually preferring to reduce their premiums.

Cattle Insurance.—The cattle insurance associations usually insure all kinds of horned cattle above a certain age, but a number of them are confined to milch cows exclusively. The system of examination and valuation is very similar to that adopted in the case of horses, but the percentage of compensation is usually lower. Some societies pay a fixed amount for all cows, but this sum is naturally low, so that members are frequently only compensated for a part of their loss.

The requisite funds are collected by levying a contribution in proportion to the losses sustained on the insured value, by fixed premiums and by other methods, but the first way is the most common. There is also a peculiar system called "uitpoinden," by which, when an animal has been slaughtered, the carcase is divided by weight amongst the members in proportion to the number of cattle for which they are insured, and they are bound to take the meat thus allotted to them at a certain price. The sum of money thus raised serves as compensation to the owner. Entrance fees are customary and depend on the amount of the reserve fund.

Insurance of Pigs.—The insurance of pigs takes place chiefly in Gelderland and Zeeland. In the first-named province this is done partly by separate associations and partly by the cattle insurance associations ; in Zeeland there are numerous pig insurance funds which accept pigs exclusively.

The pig insurance funds usually accept all pigs above the age of from two to six weeks. The compensation in case of death is determined after death ; the animal is weighed or valued, and a certain sum per kilogram or a certain percentage of the

value is paid for. The requisite money is collected by levying a fixed premium per month and per pig, and amounts to from 3s. to 4s. 2d. a year for each animal. A higher premium is levied in some instances for breeding sows.

BELGIUM.

Societies for the mutual insurance of live stock are common in the rural districts of Belgium. At the end of the year 1906 there were, according to the *Bulletin de l'Administration de l'Agriculture* (1908, No. 2), 981 cattle societies, representing 88,723 members and 257,815 head of cattle. This is rather less than three head of cattle to each member, and here, as elsewhere, these societies find their chief support among the smaller agriculturists. There were also societies for the insurance of farm horses, goats, and pigs.

The following table gives particulars of the extent of the operations of these societies in 1906 :—

—	No. of Societies.	No. of Members.	No. of Animals Insured.	Average Value.	No. of Animals Lost in 1905.
Cattle	981	88,723	257,815	13 12	6,498
Farm horses	170	20,441	38,266	34 0	1,037
Stallions	6	541	714	136 0	18
Goats	232	23,232	35,184	0 17	2,358
Pigs	42	4,109	9,698	3 12	376

It will be seen that the mortality, in the case both of cattle and farm horses, was under 3 per cent.

Compensation.—In the case of cattle the usual compensation allowed to members for the loss of an animal is two-thirds of its value, and this is paid out of the funds of the society to which all the members make periodical contributions. Another method adopted by some societies is to pay compensation out of the common fund only when the animal is declared unfit for food; but if the meat is suitable for human consumption it must be purchased by members of the society, each contributing to the price a sum proportionate to the number of animals he has insured in the society. In some societies there is no common fund, so that the compensation is raised by direct contributions from the members in every case.

Re-insurance.—Out of 981 cattle insurance societies 702 were affiliated to larger insurance societies, which guaranteed their stability by means of subsidies. The amount contributed varies, being sometimes a fixed amount per head or sometimes a proportion, usually about one-third, of the net loss incurred by the local society. The funds of the re-insuring societies are derived partly by a levy on the local societies in proportion to the value insured and partly by grants from the provincial and central governments. The horse, pig and goat societies are affiliated in the same way to larger re-insurance societies.

FRANCE.

Under the fostering efforts of the French Department of Agriculture mutual insurance has made extraordinary progress in recent years. Until 1898 no assistance was afforded by the State to these mutual insurance societies, but since then a sum, which has gradually risen from £10,000 to £30,000, has been annually included in the Agricultural Budget. This sum is devoted, in the first place, to making grants to newly established societies in proportion to their members in order to defray their preliminary expenses of formation and to give them a few pounds in hand. The sum given is usually about £20. Small subventions are also given to societies which suffered exceptional losses during the preceding year, and are based on a scale which takes into account the amount of the loss, the premiums paid and generally the efforts made by members to make up the required sum.

In order to facilitate the formation of these associations some legal difficulties as to their constitution were removed by a law passed in 1900, and they were also exempted from stamp and registration dues ; while in 1902 the Minister of Agriculture, in a circular letter to the Departmental Professors of Agriculture, urged upon them the importance of doing everything in their power to promote the establishment of societies of this character. As a result, it appears from the Minister's report (*Bulletin Mensuel*, June, 1907) that the progress has been as follows in rather less than ten years :—

		No. of Societies.	No. of Members.	Capital Insured.
December, 1897...	...	1,469	87,072	£ 2,366,000
May, 1907	...	6,730	355,600	15,396,000

This gives an average of 53 members to each society and an average insurance of £43 to each member. No information is given as to the number of animals insured, but it is evident from the amount of the insurance that it would average three to four each, so that the total number of cattle insured may be estimated at about 1,250,000. The small size of the societies is largely due to the fact that it is considered desirable that their operations should be restricted as a rule to a single commune, experience having shown that small societies are likely to be most successful, as they allow members to see that claims for compensation are not improperly made and also to keep the management entirely in their own hands.

Premiums and Compensation.—The organization of these societies varies in different districts. In some cases instead of the payment by each member of a fixed premium dependent on the capital value insured, the amount of the losses is shared amongst the members quarterly or half-yearly, the whole business of payment of losses and collection of subscriptions being transacted at one meeting. The French Minister of Agriculture points out that this method has the advantage of being easily understood by persons not well acquainted with co-operative methods, and tends to remove those feelings of distrust which are sometimes found in centres not yet accustomed to insurance or co-operation. Another type of society is that requiring the payment of a fixed annual premium. The members of these associations pay an entrance fee of 10*d.* per animal insured, but this is frequently reduced to 5*d.* in the first year of the society's existence. The annual premium is 1 per cent. of the value of the cattle insured, but this may be increased if it is insufficient to meet the demands. Compensation is paid for losses at the rate of 80 per cent., less any sums received for the flesh, &c., of the dead animal. No compensation is paid for deaths of animals under three months old or for cows over twelve years old.

Re-insurance.—The Ministry of Agriculture particularly encourages the formation of federations of the local societies for the purpose of re-insurance. There are now 44 of these unions, embracing 2,200 local societies and representing insurance to the amount of £4,250,000 sterling. The contribution made by the local societies amounts to from 2*s.* to 4*s.* per £100.

SWITZERLAND.

Compulsory Insurance.—The Swiss Federal Law of 1893 for the improvement of agriculture provides for the assistance, by means of subsidies, of any efforts made by the Cantons themselves for the compulsory insurance of live stock, but leaves the particular system to be adopted to the discretion of the provincial authorities. At the same time they have issued a pamphlet of instructions and advice as to the methods which may be adopted with advantage, and also a set of rules. It is suggested that the Cantons should provide by law for the establishment of district insurance societies by a vote of the cattle owners in the district. If a majority of the owners or a number representing more than half the total head of cattle in the district are in favour of such a society, the decision is binding on all the owners of live stock in the district, and all cattle must be insured.

Method of Insurance.—The rules which have been adopted by the Canton of Berne are stated to be fairly typical of those generally in use, and these provide for the insurance of all healthy cattle above two months and under ten years, except those temporarily introduced. For this purpose a list of all cattle is kept by the bureau, and all changes must be reported to the Secretary. An entrance fee for each animal is required at the rate of $\frac{1}{4}$ per cent. of its value. The maximum value insured is fixed at £28 for cows and bullocks and £40 for bulls. The premiums are fixed by a general meeting of the members according to the state of the funds. When an animal falls ill the owner must inform the committee and call in a qualified veterinary surgeon. Compensation is paid at the rate of 80 per cent. when the meat is saleable, or 75 per cent. when it is not. Some of the societies also include sheep, goats and pigs.

According to the report of the Federal Department of Agriculture for 1906, 14 out of the 25 Swiss Cantons have adopted the system of compulsory insurance. Compensation to the extent of £78,712 was paid on account of 14,285 head of cattle out of a total of 547,518 insured. Towards this sum the Cantons and the Federal Government each contributed £24,510.

GERMANY.

In several of the German States the small local societies, which, as in other countries, operate in a limited area, are affiliated to a central organization in such a way that part of the risk is borne by the local society and the remainder by the whole organization. Such associations are now recognized, and receive assistance from the Government in Baden, Bavaria, and Alsace-Lorraine.

Bavaria.—The Bavarian Cattle Insurance Office is based upon the principle of mutuality, and provides compensation for losses incurred by stockowners from the death or compulsory slaughter of their cattle and goats, and from the carcases of slaughtered cattle being subsequently condemned by the authorities as wholly or partially unfit for food owing to their being affected with some scheduled disease. The insurance office is an association of all the local insurance societies, which accept certain rules applicable to all alike. On the creation of the office the Bavarian Treasury provided a capital sum to be administered as a special fund, and also makes it an annual allowance of £6,250.

In 1906 there were 1,572 local societies, with 79,113 members, representing 505,769 animals valued at £4,006,000. Each society therefore was composed on the average of 50 members with 322 animals. The average value of the cattle insured was £15 6s. and of the goats 15s. The number of cattle insured represented 8.61 per cent. of the total number in Bavaria. The losses of stock during the year amounted to 10,587, or 3.43 per cent. of the number insured, made up of 7,601 cattle and 2,639 goats, together with 262 carcases condemned after slaughter. The compensation paid amounted to £90,700, towards which £31,400 was received from the sale of slaughtered animals. The central insurance office pays half the compensation, the other half being paid by the local society. The amount of compensation is seven-tenths of the value in the case of animals which die, and eight-tenths for those compulsorily slaughtered. The premiums are fixed annually according to the needs of the society, and averaged 1.40 per cent. of the insured value in 1906. Any owner of cattle or goats can become a member of such a society, but he must enter the whole of his stock, if healthy, except those under three months or

over twelve years of age. The value of the animals is determined by a committee of the society. Since 1900 a central institution similar to that described above has been in existence for horses.

SWEDEN.

The Board have received through the Foreign Office a memorandum by Sir Rennell Rodd on the insurance of live stock in Sweden, of which a summary is given below.

In the official statistics for 1905 some 327 mutual insurance companies for live stock were stated to exist in Sweden, but there were many more which had not forwarded their reports for inclusion in the statistics, and it is stated that at the present time there are as many as 674. Four of these are companies operating on a large scale throughout the country. Others are local, many of them working on quite a small scale, under rules suitable to the special locality where they are established. They are, however, all mutual in character, and work on practically identical lines. The general insurance law in force in Sweden lays down that insurance, except where it may be a function of State, may only be undertaken by companies or associations based on the principle of the mutual responsibility of the participants, and that an insurance company may not do any other business but insurance. This prevents insurance being undertaken by agricultural societies formed to exercise other functions as well.

The only State control beyond the general powers of supervision prescribed by the insurance laws and the approval of bye-laws is the obligation imposed upon all companies or associations to furnish the Government Inspector of Insurance with an annual report. The State, however, sanctions assistance being given by local administrative officials for the collection of premiums, which in such cases are paid with the Crown taxes. As a rule the premiums are paid at the end of the year and not at the beginning, the amount of the premium being contingent on the number of accidents, cases of disease, &c., which have occurred during the year. This system necessitates a loan for the initial expenses when the association comes into being.

Of the mutual associations existing in Sweden for the insurance of live stock, the Scandinavian Live Stock Insurance

Company (Skandinaviska Kreaturförsäkringsbolaget) does by far the largest business throughout the country, and a summary of its rules and methods will illustrate the principles on which such insurance is carried out.

The Scandinavian association is founded on the basis of the mutual responsibility of all its members. Every individual insured becomes a member. There are several different forms of insurance :—

I. Simple Insurance :—(1) For horses and cattle, providing payment for the full value insured. (2) For foals or the foetus of insured brood mares : (a) For a foal which dies or has to be killed within two months of its birth (after two months the foal must be insured independently); (b) for the foetus which is lost after the third month of gestation by abortion or impediment in parturition. In case of twins or multiple births, compensation is only paid as for one and no compensation if any one survives. If a brood mare has miscarried after two consecutive periods of gestation the company does not pay compensation on account of any further miscarriages by the same animal. The compensation is 10 per cent. of the value for which the mother is assured.

II. Combined Insurance.—For horses and cattle and their young on similar conditions. Under this head a reduced scale is provided, not exceeding half the value insured for, in the case of animals whose working or breeding capacity is diminished by sickness or accident, but which are still serviceable.

III. Collective Insurance against loss of cattle (or insurance "en masse"—*Masskadeförsäkring*), which provides compensation to the value insured in the case of animals which die or have to be killed in consequence of certain diseases specified in the policy.

IV. Insurance against contagious diseases and loss of milk :—Compensation is being paid under this head : (a) For cattle which die of any one of the diseases which the insurance contemplates. (2) For milk from the day on which the outbreak of an epidemic is established as long as the farm is declared infected. (3) For loss occasioned by deficiency of pasture. (4) For straw fodder which is damaged by disinfection, or has to be destroyed as a precautionary measure. (5) For disinfecting materials which the policy-holder is obliged to provide.

The insurance of cattle must include all the bulls, cows and calves on the farm, but oxen may be insured separately. Valuable bulls can be separately valued and insured. The insurance valuation of young horses is progressively raised between the first and fourth year. After the age of 10 years for carthorses and of 12 years for other horses the valuation is reduced by 10 per cent. every year until they reach 20 years, when the insurance terminates. The insurance valuation of individual cattle is reduced by 15 per cent. yearly after they have passed the age of eight years.

When any animal which has been insured falls sick or is injured a veterinary officer must be called in.

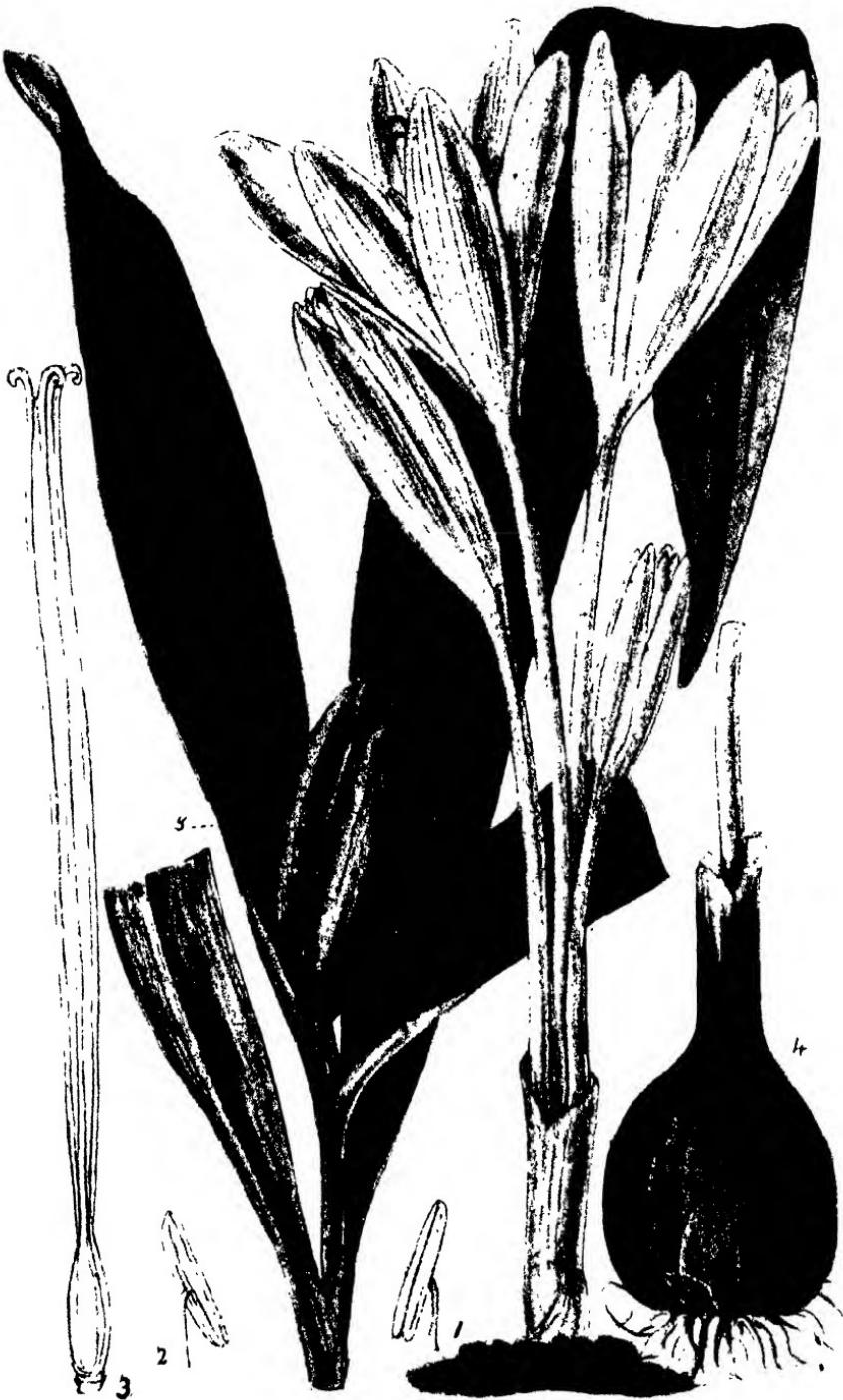
The policy provides for certain circumstances under which compensation for insured animals is not paid, such as non-compliance with the regulations, loss occasioned by fire or lightning, which must be insured against separately; or if the animal is unserviceable for work or breeding through any other cause than sickness or accident; or if the animal has to be killed or loses value by reason of tuberculosis.

Premiums.—The directors fix the amount of the premium as soon as the result of the year's work has been ascertained, and it must be sufficient to cover : (1) Compensation paid ; (2) cost of administration ; (3) interest on money raised to pay compensation in advance of the payment of the premiums ; and (4) the provision of a reserve fund. Insurance may be accepted at normal rates or an additional premium demanded for special risks, as in the case of horses insured for more than £44 and cattle for more than £27 10s., and for horses in cities.

MEADOW SAFFRON.

Meadow saffron (*Colchicum autumnale*, L.) is a plant belonging to the order Liliaceae, with flowers closely resembling crocuses. The leaves are lanceolate in shape, dark green in colour, and several inches in length; they are fully developed in spring, dying down during the summer. The flowers are whitish or pale purple in colour, and may be found locally in meadows from the far north of England to the South Coast. The plant is said especially to occur on limestone. Meadow saffron grows from corms (or bulb-like fleshy underground stems) about the size of small tulip bulbs. These lie about 6 to 10 in. beneath the surface of the soil. Although flowering takes place from August to October the blooms soon die down, and the seed vessel remains beneath the surface of the ground until the next spring, when it is sent above ground and the seeds ripen.

Meadow saffron—known also as autumn crocus, meadow crocus, naked ladies, &c.—is poisonous in all its parts. “As the plant is injurious to most animals and man, it should be destroyed in fields, for cattle will sometimes crop the leaves



In. Smith del.

MEADOW SAFFRON (*Colchicum autumnale*, L.)

in the spring" [*English Botany*, Vol. ix, p. 225]. Percival writes, "Experiment has shown that from 3 to 5 lb. of green eaves and seed vessels are necessary to act fatally upon a cow; the poison, however, appears to be cumulative and a small quantity eaten each day with other food for a few days may lead to fatal results" [*Agricultural Botany*, p. 593]. The poisonous principle, known as *Colchicine*, is not volatile, and is not removed by drying the plants. In an account of the plant published in *The Journal of the Royal Agricultural Society* [Vol. 66, 1905, p. 164] it is remarked that, "It is an irritant poison, causing violent purging. This plant was the probable cause of the cows dropping their calves, the farmer having lost between eighty and ninety calves."

Where meadows are infested with *C. autumnale* in very small numbers they may be dug out by hand, and the whole plant burnt. Where, however, they occur in extensive patches the best method is to pull off all leaves by hand as fast as they appear in spring and burn them. Percival remarks that if this practice is repeated for one or two seasons there is no necessity to dig up the corms, the plant being readily exterminated.

The effects of heavy dressings of such soluble manures as superphosphate, sulphate of ammonia, and kainit might be tried, both alone and in combination.

Description of Coloured Plate.—1. and 2. Anthers; 3. Pistil; 4. Corm; 5. Seed Vessel. A plant in bloom is figured as it characteristically appears in the field.

**Notes on Insect,
Fungus, and Other
Pests.***

Cockroaches.—The so-called black beetles, or cockroaches, are not true beetles, but belong to the order *Orthoptera*, the technical name being *Periplaneta*. Eggs are laid, and the young forms which hatch out resemble the parent, except that they are smaller, wingless and immature. These young grow and moult until they become winged adults. Cockroaches may do much damage

* Notes on insect, fungus and other pests, dealing with the specimens submitted to the Board for identification, and their apparent prevalence, will appear in this *Journal* month by month. The notes commenced with the issue for June, 1907.

to provisions in houses, stores, &c., and are frequently a great pest. They may be dealt with as follows :—

(1) Persian insect powder (*Pyrethrum*) or Keating's insect powder may be thoroughly dusted amongst their haunts ; this will at least stupefy the cockroaches, which should be swept together and dropped into boiling water.

(2) Flour and sugar may be mixed with a little plaster of Paris, and the mixture spread in the runs ; the insects which eat the mixture will be killed.

(3) Steep-sided basins containing some sweetened liquid may be placed here and there where the insects are troublesome. Little pieces of wood should be placed against the basins, so that the cockroaches can reach them, and once they have got into the basins the wingless forms will be unable to get out. The cockroaches trapped should have boiling water poured over them, thus causing instantaneous death. Patent traps for destroying cockroaches may be purchased.

Otiorhynchus Beetle.—Pupæ of an *Otiorhynchus* beetle were forwarded from Bournemouth during February. These beetles are harmful both in the grub and the adult state, the grubs doing harm below ground and the adults above. Information as to these beetles will be found in Leaflet No. 2 (*Vine, Plum, Hop and Raspberry Weevils*). The beetles may be trapped by twisting bands of hay here and there among the plants. These traps should be visited regularly and the beetles destroyed.

Springtails.—Specimens of scarlet runners from Preston and of irises from Sidcup were found to be infested with springtails or *Collembola*. Although the destructiveness of these insects has been proved, it is unlikely that "the general failure of irises and lilliums" remarked on by the Sidcup correspondent would be due to springtails alone. A note on springtails will be found on p. 557 of this *Journal* for December, 1907.

Mites on Gooseberries.—Specimens of mite-infested gooseberry bushes were submitted during February, and were found to be attacked by red spiders (Leaflet No. 41). These mites are not like the black currant mite *Eriophyes* (Leaflet No. 1), but are more like meal mites. Three genera of the red spider family, or *Tetranychidae*, are mentioned in the Board's leaflet as found on fruit plants, viz., *Bryobia*, *Tenuipalpus*, and

Tetranychus. These genera may be distinguished under the microscope as follows :—

<i>Bryobia</i> .	<i>Tenuipalpus</i> .	<i>Tetranychus</i> .
Fore margin of the front part of the body has four scale-like projections ; the first pair of legs are longer than the body.	No scale-like projections ; the legs are short and heavy.	No scale-like projections ; the first pair of legs are longer than the body.

Before the buds begin to burst the bushes should be sprayed with paraffin emulsion, and spraying should be done carefully in order to reach the eggs, which may be seen in the various chinks. A careful outlook should be kept in case the mites show on the young leaves. The *Bryobia* of the gooseberry has in hot dry seasons proved very destructive to gooseberry bushes. It also lives and thrives on ivy, and this should be borne in mind where ivy is plentiful.

Eelworms found in the soil in pots of tomatoes were sent from Poulton-le-Fylde, but were not of the species which infest tomato plants. Information as to eelworms will be found in Leaflet No. 75 (*Root-knot Disease in Cucumbers and Tomatoes*), and in No. 46 (*Stem Eelworm*).

Gooseberry and currant shoots from Kingsbridge, Devon, were found to have their tips injured by greenfly. (See Leaflet No. 68, *Currant Aphides*.)

Fungi.—Specimens of gooseberry plants from Dunstable were found to be covered with the harmless saprophyte *Phoma grossulariae*, Schulz. and Sacc., which is shed with the epidermis.

Seed potatoes from Chester were found to be infested with the mycelium of *Macrosporium solani*, Cke. (potato leaf-curl), in the form of brown patches in the interior of the tuber. Such tubers should not be used for seed purposes. (See Leaflet No. 164.)

Potatoes from Feltham (Middlesex) were badly attacked by potato disease, *Phytophthora infestans*. (See Leaflet No. 23.)

Samples of narcissus sent from Penryn (Cornwall) were found to be suffering from a bacterial disease known as "yellow stripe." No satisfactory remedy for the disease is known, but it is advisable to remove and burn all bulbs that are badly attacked.

The task of examining and recording the nature and character of the soil, which is the work of a "soil survey," has been

undertaken in several Continental
countries, such as Germany, Belgium,
and France, and its value as a means of
assisting agriculturists in judging of the

manorial needs of the soil has frequently been urged in this country. An attempt was made some years ago by the University College of Reading to analyse samples of soil taken from districts in Dorset in such a way as to represent the various geological formations in the country and to be typical of considerable areas of land. Reports were drawn up giving the results of the analyses and suggestions for manuring. Apart, however, from local efforts of this character, the only basis for soil maps existing in this country is the "drift" maps of the Geological Survey, which show the superficial deposits of clay, alluvium, gravel, &c., which overlie the solid formations. For England and Wales a large number of drift maps on the 1 in. scale have been published, but these are believed to be too small to admit of the necessary detail. The publication of maps on the 6-in. scale is restricted to mining areas, though the manuscript maps on this scale are available for copying or for reference.

In the United States, on the other hand, the work of the Soil Survey, which was begun in 1899, has been rapidly pushed forward, but it may be noted that in a comparatively new country the work partakes to some extent of the nature of an exploration and aims at showing the capacities of the land for new crops and industries, whereas in an old and highly cultivated country the suitability of the soil for different crops has become known through local experience.

According to an article by Mr. J. A. Bansteel in *The Year Book of the United States Department of Agriculture* for 1906, some 76,000,000 acres, or about one-tenth of the farm area, has been mapped out. The Survey recognises at present 13 great soil provinces, 58 soil series, and 461 soil types. Of these types some 130 are more or less local in character, while the remainder are of widespread occurrence. The soils are examined to determine (1) their texture, or the relative amounts of coarse or fine particles of which they consist; (2) their

structure, or the relationship of these particles ; (3) their organic matter ; and (4) their natural drainage and topography. All masses or areas of soil which are found to be closely similar in all these respects are said to belong to the same soil type, and under similar climatic conditions the type is capable of producing similar kinds of crops. It has also been found that several soil types in a given region may differ only in their texture, being identical or similar in all other respects. Such a group of soils is called a series. Again, several series have been found to be derived from the same classes of material and to exist in a region having similar climatic features, and such a region constitutes a "soil province."

The separate report upon each soil-survey area contains an account of each soil type within the area. It gives a description of the characteristic appearance of the type and summarises the uses to which it is put and the agricultural methods adopted. Each report also contains an account of the crops raised in other areas where the same type of soil has been met with, and suggestions are made as to new crops or new methods.

From these reports the individual farmer may learn the relationship of the soil upon his own farm, not only to the other soils in the immediate neighbourhood, but to soils of the same character in widely separated regions. He may thus observe the results obtained by other farmers upon these soils, and apply their experience to his own conditions.

There is in the United States a large class of persons who for various reasons desire to secure new farms in more or less distant localities, and who therefore require information which will enable them to compare conditions known to them with those of the new localities under consideration. These soil survey reports enable the Department of Agriculture to furnish such enquirers with information upon which a judgment may be based, and they are also very largely used by educational institutions. Besides the immediate uses of the soil survey, it is considered that it is likely to be of the greatest value in encouraging and facilitating the cultivation of crops in those districts for which they are most suitable.

A Bill has recently been introduced into the United States House of Representatives to provide for the inspection and grading of grain and to secure uniformity in standards and classification. For a number of years complaints have been prevalent as to the present system of grading, and the subject was referred to in the President's message to the two Houses of Congress at the beginning of the session of 1907, as follows :—“The grain-producing industry of the country, one of the most important in the United States, deserves special consideration at the hands of the Congress. Our grain is sold almost exclusively by grades. To secure satisfactory results in our home markets and to facilitate our trade abroad these grades should approximate the highest degree of uniformity and certainty. The present diverse methods of inspection and grading throughout the country under different laws and boards result in confusion and lack of uniformity, destroying that confidence which is necessary for healthful trade. Complaints against the present methods have continued for years, and they are growing in volume and intensity, not only in this country but abroad. I therefore suggest to the Congress the advisability of a national system of inspection and grading of grain entering into inter-state and foreign commerce as a remedy for the present evils.”

The Bill which has been introduced establishes a section of grain inspection and grading in the Department of Agriculture, and provides for the appointment of inspectors at the principal grain centres. These inspectors are to inspect and grade grain in accordance with such standards as may be determined and to issue certificates for it, and such grain is not to be mixed with grain of a different grade without being re-inspected and graded. The shipment of grain from one State to another or to a foreign country without previous inspection and grading is prohibited.

In continuation of the information published last month (*Journal*, March, 1908, p. 738) Mr. Consul-General Chapman has now furnished some further particulars on this subject.

Importation of Live Stock into Brazil. As regards climate, it appears from observations recorded at certain places in

Brazil that the following represents the approximate range of temperature: Rio de Janeiro, 58° to 83° F.; Pará, 75° to 90°; Bahia, 72° to 87°; São Paulo, 41° to 76°; Minas Geraes, 45° to 80°; Paraná, 32° to 77°; Rio Grande do Sul, 44° to 84°; and Mato Grosso 57° to 86° F. Not many rainfall returns are available, but there was a fall of 45 in. in Rio de Janeiro, 85½ in. in Pará, and 67½ in. in Rio Grande do Sul in 1904–05. On the whole Brazil is hotter than Argentina, but the greater heat does not necessarily imply drought or want of pasture. Generally speaking, the climate of the country is damp, but some of the northern states suffer from drought. The interior, which rises in plateaux, is far more temperate and equable than the coast lands; while heavy dews, at any rate in Minas Geraes, keep the grass from being burnt up.

To seek for suitable districts it is necessary that some one acquainted with the required conditions should travel through the country with that object. Information could best be obtained in Rio de Janeiro as to the districts to visit, but it is important that all information be verified by an expert or professional cattleman. There are certain localities which are not suitable for live stock owing to the prevalence of fever.

There is no proper information as to cattle diseases, nor does there appear to be any control over them. Reports occasionally arrive of districts where there is scarcely any meat in the market or of districts where foot-and-mouth disease is prevalent.

Mr. Chapman considers that there is a good business to be done in the country by establishing breeding centres, and provided that sales are made in England or that all responsibility ceases on arrival at the port of delivery, the shipper would incur no risks from disease. It is a business, however, which requires to be examined into by a practical man, who, taking into account all the drawbacks, would be able to come to a decision in the matter.

As regards the State of São Paulo, Mr. R. Sandall, Acting-Consul, states that the Department of Agriculture is very active in encouraging the importation of fine specimens of cattle, horses, sheep and swine for breeding purposes, and considers that there should be an opening for the export of live stock of this description from the United Kingdom. Not long ago

the State Government went to considerable expense in importing zebu cattle from India. The State Government bears all transport charges, including the insurance of animals imported for stud purposes, and the Federal Government grants exemption from duty.

In the case of the State of Paraná, the British Vice-Consul observes that there is no importation worth mentioning of improved breeds of live stock from the United Kingdom, chiefly on account of the greater advantages offered to breeders by the Argentine Republic. The country, though suitable for agricultural and breeding purposes, is not sufficiently developed for stock ranges at the present time.

It may also be noted that the Brazilian budget provides for an expenditure of 3,000,000 milréis for the promotion of a National Exhibition of Agriculture, Industries and Fine Arts in the Federal capital. All the agricultural implements, tools, machinery and accessories which were admitted in 1906 and 1907 at a reduced rate of duty of 5 per cent. *ad valorem* when imported for their own use by agricultural syndicates, or directly by agriculturists, cattle breeders or by State or municipal administrations, are to be admitted under the same conditions on payment only of a registration charge of 2 per cent. (See *Board of Trade Journal*, 20th February, 1908.)

In connection with the article on apple culture which appeared in this *Journal* for January, 1905, the Board think

Varieties of Apples suitable for Different Districts. it may be useful to give a list of varieties of apples which are considered by experts to be suitable for planting in different parts of the country. A selected list of dessert and cooking varieties has therefore

been compiled, on the advice of Mr. George Bunyard and Mr. W. Goaring, from *British Apples*,* and from an article in the *Journal of Horticulture*, 7th November, 1907, which gave the opinions of a number of growers as to the most desirable varieties for private gardens, and included the result of an election of market varieties made during the previous year.

* Report of the Committee of the National Apple Congress held in the Royal Horticultural Gardens, Chiswick, October 5th to 25th, 1883. Compiled and prepared by Mr. A. F. Barron.

Considerable changes in the value of varieties have taken place since 1883, when the Horticultural Society's list was compiled, many of the then highly placed sorts being now less cultivated, while a considerable number of sorts which then came low on the list are now much prized. As an example, Lane's Prince Albert and Lord Suffield may be compared. In *British Apples*, p. 159, the former was placed forty-fifth on the list compared with first place for Lord Suffield. In the *Journal of Horticulture*, Lane's Prince Albert was bracketed second, while Lord Suffield was placed eleventh.

The following list will show which apples are now considered most valuable for market growing for the respective groups of counties. The varieties must not, however, be supposed to be given in order of merit, while they are not necessarily the most desirable for private gardens.

SOUTHERN COUNTIES.

Dessert Varieties.—Cox's Orange Pippin; King of the Pippins; Blenheim Orange, Devonshire Quarrenden, Yellow Ingestre; Worcester Pearmain; Mr. Gladstone; Duchessa's Favourite, Allington Pippin, Beauty of Bath; Ben's Red, Christmas Pearmain; Gascoyne's Scarlet, James Grieve; Lady Sudeley.

Culinary Varieties.—Dumelow's Seedling; Warner's King; Blenheim Orange; New (or Winter) Hawthornden, Ecklinville Seedling, Stirling Castle (on Dwarf), Golden Noble, Annie Elizabeth; Lord Derby; Potts' Seedling (on Dwarf), Tower of Glamis, Lane's Prince Albert, Bismarck; Bramley's Seedling, Early Victoria, Gascoyne's Scarlet, Grenadier, Newton Wonder, Royal Jubilee, Norfolk Beauty.

EASTERN COUNTIES.

Dessert Varieties.—Cox's Orange Pippin, Blenheim Orange; Red Quarrenden; Allington Pippin; Beauty of Bath; Ben's Red, Christmas Pearmain, Gascoyne's Scarlet, James Grieve, Lady Sudeley.

Culinary Varieties.—Dumelow's Seedling, Warner's King; Blenheim Orange; New Hawthornden, Ecklinville Seedling, Bismarck, Bramley's Seedling; Gascoyne's Scarlet; Grenadier; Lane's Prince Albert, Newton Wonder; Norfolk Beauty; Royal Jubilee.

MIDLAND COUNTIES (SOUTH).

Dessert Varieties.—Cox's Orange Pippin; King of the Pippins; Devonshire Quarrenden; Mr. Gladstone; Worcester Pearmain, Blenheim Orange; Early Julian; Allington Pippin; Beauty of Bath; Ben's Red; Christmas Pearmain; James Grieve; Lady Sudeley.

Culinary Varieties.—Blenheim Orange, Dumelow's Seedling; Golden Noble; Ecklinville Seedling; New, Hawthornden; Cox's Pomona; Lord Derby; Lord Grosvenor; Stirling Castle (on Dwarf); Alfriston; Mère de Menage; Grenadier; Lane's Prince Albert; Tower of Glamis.

MIDLAND COUNTIES (NORTH).

Dessert Varieties.—Cox's Orange Pippin; Blenheim Orange; King of the Pippins; Mr. Gladstone; Allington Pippin; Beauty of Bath; Ben's Red; Christmas Pearmain; James Grieve; Lady Sudeley.

Culinary Varieties.—Dumelow's Seedling; Warner's King; Ecklinville Seedling; Golden Noble; Alfriston; Blenheim Orange; New (or Winter) Haworthden; Annie Elizabeth; Northern Greening; Lord Grosvenor; Mère de Ménage; Cox's Pomona; Potts' Seedling; Bramley's Seedling; Early Victoria; Grenadier; Lane's Prince Albert; Newton Wonder; Norfolk Beauty; Royal Jubilee.

WESTERN COUNTIES.

Dessert Varieties.—Cox's Orange Pippin; King of the Pippins; Devonshire Quarrenden; Blenheim Orange; Yellow Ingestre; Worcester Pearmain; Adams' Pearmain; Allington Pippin; Beauty of Bath; Ben's Red; Christmas Pearmain; Gascoyne's Scarlet; James Grieve; Lady Sudeley.

Culinary Varieties.—Blenheim Orange; Dumelow's Seedling; Warner's King; New (or Winter) Haworthden; Golden Noble; Tom Putt; Ecklinville Seedling; Stirling Castle; Tower of Glamis; Lord Derby; Alfriston; Northern Greening; Bismarck; Bramley's Seedling; Gascoyne's Scarlet; Grenadier; Lane's Prince Albert; Newton Wonder; Norfolk Beauty; Royal Jubilee.

NORTHERN COUNTIES.

Dessert Varieties.—Cox's Orange Pippin; King of the Pippins; Blenheim Orange; Irish Peach; Devonshire Quarrenden; Yellow Ingestre; Allington Pippin; Beauty of Bath; Ben's Red; Christmas Pearmain; James Grieve; Lady Sudeley; Langley Beauty.

Culinary Varieties.—Dumelow's Seedling; New Haworthden; Warner's King; Cellini; Cox's Pomona; Potts' Seedling; Stirling Castle; Alfriston; Ecklinville Seedling; Tower of Glamis; Early Victoria; Grenadier; Lane's Prince Albert; Norfolk Beauty; Royal Jubilee; Galloway Pippin.

SCOTLAND.

Dessert Varieties.—Ribston Pippin; King of the Pippins; Kerry Pippin; Blenheim Orange; Devonshire Quarrenden; Irish Peach; Worcester Pearmain; Margil; Yellow Ingestre; Allington Pippin; Beauty of Bath; Ben's Red; Christmas Pearmain; James Grieve; Lady Sudeley.

Culinary Varieties.—Stirling Castle; Warner's King; Ecklinville Seedling; Keswick Codlin; Cellini; Dumelow's Seedling; Tower of Glamis; New (or Winter) Haworthden; Alfriston; Cox's Pomona; Small's Admirable; Duchess of Oldenburgh; Golden Noble; Bramley's Seedling; Early Victoria; Grenadier; Lane's Prince Albert; Newton Wonder; Royal Jubilee.

GENERAL LIST OF BEST APPLES.

Dessert Varieties.—King of the Pippins; Cox's Orange Pippin; Blenheim Orange; Devonshire Quarrenden; Yellow Ingestre; Worcester Pearmain; Mr. Gladstone; Allington Pippin; Beauty of Bath; Ben's Red; Ribston Pippin (Cankers); Kerry Pippin (too small); Christmas Pearmain; Gascoyne's Scarlet; James Grieve; Lady Sudeley.

Culinary Varieties.—Bramley's Seedling; Newton Wonder; Warner's King; Lane's Prince Albert; Grenadier; Lord Grosvenor; Blenheim Orange; New (or Winter) Haworthden; Ecklinville Seedling; Stirling Castle (on Dwarf); Golden Noble; Cox's Pomona; Alfriston; Northern Greening; Emperor Alexander; Tower of Glamis; Mère de Ménage; Lord Derby; Annie Elizabeth; Lady Henniker; Bismarck; Early Victoria; Gascoyne's Scarlet; Norfolk Beauty; Royal Jubilee.

The eight report, by the Duke of Bedford, K.G., and Mr. Spencer U. Pickering, F.R.S., on the work of the Woburn Experimental Fruit Farm, deals entirely with insecticides and fungicides, and furnishes a detailed account of the very valuable investigations carried out at this station. It is remarked in the opening chapter that the aim has been to substitute as far as possible exact quantitative measurements for those more crude and unsatisfactory methods usually adopted, in which the impression produced on the mind of the observer is the sole standard by which the success or failure of an insecticide is gauged. The principle adopted has been to ascertain what is the action of an insecticide when it is applied under the simplest and most perfect conditions possible, as in the laboratory, and then to ascertain the results when it is applied in the plantation under ordinary conditions of practice. Besides investigations into the effect of certain insecticides, the report contains an account of an examination of the nature of the substances constituting some of these insecticides, which, in the case of emulsion, has resulted in the introduction of a class of emulsifiers which may be substituted with great advantage for soap and such like substances, especially in cases where soap causes much trouble and inconvenience; whilst an investigation into the chemistry of Bordeaux mixture has resulted in showing how the cost of that substance may be reduced by three-fifths without in any way diminishing its effectiveness.

Bordeaux Mixture.—The investigation into the nature of the compounds formed by the action of lime on copper sulphate has shown that as many as six different substances may be present in Bordeaux mixture. That which is present when the mixture is made in the ordinary way, by adding excess of lime in the form of milk to copper sulphate, is a double basic sulphate of copper and calcium. The carbonic acid of the air acts on this, forming carbonates and sulphates of the metals, and it is owing to the gradual reformation of sulphate of copper in this way, that the mixture possesses fungicidal properties. But the basic sulphate of calcium present has to be decomposed before the basic sulphate of copper is attacked, so that a certain time always elapses before the mixture begins to behave as a

fungicide. This is a great disadvantage, but can be obviated by using only just sufficient lime to precipitate all the copper in the first instance, for, in that case, a precipitate is formed which contains none of the basic calcium sulphate. There is, further, a great advantage in thus reducing the lime used, for the basic copper sulphate precipitated is a less basic compound than that in ordinary Bordeaux mixture, and it liberates two and a-half times as much copper sulphate by the subsequent action of the air ; so that a mixture as efficient as the ordinary one may be obtained, with the use of only two-fifths of the quantity of copper sulphate.

To make this mixture, clear lime-water, instead of milk of lime, must be used ; 6 lb. $6\frac{1}{2}$ oz. of copper sulphate are dissolved in water in a wooden pail : and into another large tub of water 2 or 3 lb. of fresh lime are put : after being stirred several times, and allowed to settle, 86 gallons of the clear lime-water are tapped off, and mixed with the copper sulphate, the whole being made up to 100 gallons by the addition of soft water. The mixture must always be tested to make sure that all the copper has been precipitated, and if this is not so, a little more lime-water must be added, and the testing repeated. If the liquid gives no red colour with potassium ferrocyanide it is in a proper condition for use. The stain produced on a steel knife is often recommended as a test for unprecipitated copper, but it is neither delicate or safe. Any excess of lime added above the minimum required for the complete precipitation of the copper weakens the mixture, and represents a direct loss of money. The scorching of foliage sometimes noticed with Bordeaux mixture may be caused by the same substance (the copper sulphate liberated) as that which gives it its fungicidal properties, and if so, such scorching is inevitable ; it is certainly a fallacy to suppose that it can be avoided by using excess of lime, indeed, it is very probable that the scorching often observed is due to the large excess of lime used. The mixture made with lime-water as above does not scorch foliage any more than the ordinary mixture, probably less, and has been in constant use in Italy for many years.

Emulsions.—The investigation into the nature of emulsions has led to the conclusion that emulsification of an oil in water depends on the presence of minute solid particles which arrange

themselves round the oil globules, enclosing them in a sort of skin, and thus preventing them from coming into contact with each other and coalescing. Of many substances investigated, the basic sulphates of copper, of iron and of some other metals are amongst the best. It is only necessary to add a little lime to a solution of sulphate of copper or sulphate of iron to obtain a precipitate of the basic sulphates, and, when paraffin is churned up with these, it immediately forms a bulky and fine-grained emulsion, which is quite permanent, and is perfect for spraying purposes. No heating is required, and one or two strokes of a syringe are sufficient to ensure emulsification. The great advantage in using such an emulsifier is that various substances may be mixed with the emulsion, which, had soap been used, could not be added without destroying the emulsion. Thus caustic soda added to an emulsion of paraffin in soft soap destroys the soft soap, and causes the separation of the paraffin ; such a mixture can only be used if it is kept constantly agitated, and, even then, the distribution of the paraffin on the trees is very uneven. With copper or iron sulphates as emulsifiers, the addition of caustic soda produces no de-emulsification.

When the sulphate of copper is used, the wash will have fungicidal properties, and will, as a matter of fact, contain Bordeaux mixture ; if no fungicidal properties are required, the cheaper sulphate of iron may be used. For winter-washing an emulsion-soda wash, now known as the Woburn Wash, may be made by dissolving 1½ lb. of copper sulphate in 8 or 9 gallons of water in a wooden pail, adding to it ½ lb. of fresh lime ; this should be previously slaked, and made into a milk with water, running it in through a piece of sacking so as to eliminate grits ; the mixture is then churned with 5 pints of paraffin, 2 lb. of caustic soda are added and the whole made up to 10 gallons.

When iron sulphate is used the amount of sulphate taken may be reduced to 8 oz. for 10 gallons. It is also possible with iron, but not with copper, to dispense with the lime, increasing the amount of soda to 2½ lb., and adding this before the paraffin, but in both cases lime gives the finest emulsion. A high boiling paraffin, such as solar distillate (which is less than half the price of lighting oil), gives the best results.

For summer use as an insecticide for caterpillars and aphid,

the iron wash may be used without the caustic soda, and with the amount of paraffin reduced to 16 to 24 oz. to the 10 gallons ; or if fungicidal properties are also required, copper, instead of iron sulphate, should be used. With 24 oz. of solar distillate the emulsion produced is of about the same density as water, and will remain permanently suspended in it. With all these washes, however, the tendency of the emulsion to rise to the surface is so small, that no agitation is necessary during use.

The report also contains an account of the investigations into lead arsenate, as well as a description of the experimental treatment of mussel scale; apple sucker, caterpillars, aphis, apple mildew, woolly aphis and apple leaf-spot. The effect of various washes on trees has been tested, and the nature of the action of insecticides is discussed.

OFFICIAL CIRCULARS AND NOTICES.

The attention of the Board of Agriculture and Fisheries has been called to the danger which may arise to farm animals in Great Britain in connection with the **Infection of Animals** shipment, in foreign ports, of commodities with **Anthrax** through which may contain the spores of anthrax.

the Medium of Imported Feeding Stuffs. Anthrax is a disease which not only affects all animals, especially cattle and swine, but also human beings. Infection is contracted by spores of the anthrax bacillus obtaining entrance to the system through a cut or abrasion of the skin, and by ingestion or inhalation of infected material. The disease may be rapidly fatal.

Anthrax is known to be extremely prevalent in animals in many parts of the world from which supplies of raw hides, horse hair and bristles, wool, and feeding stuffs, are drawn, and there is ample evidence to show that infection is conveyed to this country by means of these and other animal substances, more especially when brought from eastern countries, where the precautions taken to minimise the risk of the shipment of infective material are in many cases quite inadequate, if indeed they exist at all. Not only the cargo in question, but the parts of the vessels in which it is carried may become the medium by which infection is spread, unless adequate steps be taken to guard against the risk.

Anthrax spores shaken from the substances thus conveyed may become mixed with the dust and sweepings of the vessel's hold, or adhere to the sides of the hold, and may subsequently become attached to the surface of other cargo carried therein. Where the other cargo is intended for use in connection with animals—*e.g.*, where cattle-feeding cake or other cattle food is carried in the hold—*infection may be indirectly conveyed by it to animals of the farm.*

Manure into the composition of which the blood or bones of animals enter may also contain the spores of anthrax.

The Board desire therefore to suggest that special precautions should be adopted, where cargo of the nature above described has been carried, to secure the most thorough disinfection of which circumstances admit of any hold or other parts of the vessel in which it has been carried before such places are used for carrying any cargo likely to be used as cattle food.

The following process of disinfection is recommended :— Thoroughly sprinkle the compartment to be disinfected with an antiseptic solution to prevent the raising of dust. Sweep down the sides and floors ; carefully collect all dust and refuse therefrom and destroy by fire. Then wash the sides and floors with a strong solution of miscible carbolic acid (not less than 5 per cent. of acid) or a 3 per cent. solution of formalin which contains not less than 40 per cent. of formaldehyde. Persons employed on the work should wear indiarubber gloves as a protection against inoculation.

It should always be borne in mind that the spores of anthrax have great resisting power.

The Board have issued the following circular, dated 20th March, 1908, to local authorities in Great Britain :—

SIR,

Diseases Communicable between Man and Animals.

I am directed by the Board of Agriculture and Fisheries to state, for the information of your Local Authority, that instances have been brought to the notice of the Board from time to time of the occurrence in the human subject of cases of anthrax, glanders and hydrophobia, in which the facts suggested that infection had been conveyed from an animal or its carcase to man. In view of the communicability of these three diseases between man and animals, the Board have been in correspondence with the Local Government Boards for England and Scotland as to the desirability of making some general arrange-

ment so that local authorities under the Diseases of Animals Acts, 1894 to 1903, may be notified of the occurrence of any cases in which an inquiry under those Acts might with advantage be instituted.

As a result of this correspondence the Local Government Boards for England and Scotland have now issued circulars to the public health authorities suggesting that medical officers of health should be invited to communicate particulars of any cases or suspected cases of the kind which may come to their knowledge to the clerk of the local authority under the Diseases of Animals Acts of the district concerned. Notification in the opposite direction, *i.e.*, from the local authority under the Diseases of Animals Acts to the medical officer of health, is already required under Article 1 (3) of the Anthrax Order of 1899 and under Article 3 (3) of the Glanders or Farcy Order of 1907.

In proposing this arrangement, the Board had in view the necessity for discovering by every possible means cases of disease in animals which might otherwise remain undetected, and they would be glad if your local authority would cause inquiry to be made forthwith and take any necessary action under either of the two Orders of the Board above mentioned, or under the Rabies Order of 1897 as amended by the Dogs Order of 1906, or under the Importation of Dogs Order of 1901, whenever information supplied by a medical officer of health suggests that cases of disease have not been reported and dealt with as those Orders require.

The Board trust that in this manner future cases of any of the three diseases in question, either in man or in animals, will be reduced in number and their evil effects mitigated.

I am, &c.,

T H ELLIOTT, *Secretary.*

The Board of Agriculture and Fisheries have addressed the following circular, dated 6th March, 1908, to County Councils and Councils of County Boroughs in England and Wales :—

**Model Rules as to
Small Holdings for
Adoption by Local
Authorities.**

SIR,

I am directed by the Board of Agriculture and Fisheries to remind you that under section 7 of the Small Holdings Act, 1892, and section 10 of the Small Holdings and Allotments Act, 1907, County Councils

and the Councils of County Boroughs are required to make Rules for carrying these Acts into effect. The Rules must provide in particular —

- (a) as to the manner in which holdings are to be sold or let or offered for sale or letting;
- (b) as to the notice to be given of the offer for sale or letting;
- (c) for guarding against any small holding being let or sold to a person who is unable to cultivate it properly, and otherwise for securing the proper cultivation of a holding, and
- (d) for prescribing the terms and conditions on or subject to which small holdings are to be sold or let by the Council.

In view of the fact that the Rules to be made are subject to confirmation by the Board, they have prepared Model Rules for the guidance of Councils, twelve copies of which are enclosed herewith.*

* Not printed.

2. The Rules have been mainly drawn with reference to cases where an estate which has been acquired by a Council is sub-divided into a number of small holdings, and then offered for sale or letting. Rules 5 and 7 will not be altogether applicable to cases where a small quantity of land is acquired for one or more particular applicants, and Rule 11 has therefore been added in order that a Council may, if they think it desirable, exempt such cases from the operation of the Rules.

3. Your Council will observe that the form of application in the Appendix to the Rules is prepared so as to cover applications for purchase as well as hiring. The attention of the Board has however been drawn to the desirability of using separate forms of application for leasing and for purchase, and I am accordingly to suggest that your Council should adopt this course in printing their forms, so as to avoid any misunderstanding on the part of those who apply. This does not preclude the adoption of the rule in its present form.

4. The form of agreement for letting is drawn to meet the case of annual tenancies, but if in any case your Council decide to let for a term of years, the form can be modified accordingly.

5. I am to request that you will submit these rules for the consideration of your Council, and the Board will be obliged if you will send them in draft two copies of the rules which your Council propose to adopt, showing any modifications in the model rules which they desire.

I shall be glad to send additional copies of the rules on application.

I am, &c.,

T. H. ELLIOTT.

Secretary.

Agricultural Show at Madrid.—The Board of Agriculture and Fisheries have received, through the Foreign Office, information from the Spanish Government intimating that an agricultural show will be held at Madrid from the 22nd to the 27th May next. It will include (1) classes for foreign breeds of horses, cattle, sheep and pigs, and (2) an exhibition of agricultural machinery and implements. Particulars as to the rules, prizes, &c., may be obtained at the offices of the Board of Agriculture and Fisheries, 8, Whitehall Place, S.W. Intending exhibitors should apply to the Secretary of the "Association General de Ganaderos," 30 Calle de las Huertas, Madrid, for forms of entry, which must be received by him before the 30th of April. Preliminary particulars of machinery exhibits should have been supplied before the 30th March.

Any horse sent to compete from this country will require to be accompanied on its return to Great Britain by a certificate of a veterinary surgeon to the effect that he examined the animal immediately before it was embarked, or whilst it was on board of the vessel, as the case may be, and that he found that the animal showed no symptom of glanders. Cattle, sheep and pigs could not be returned to this country.

Importation of Hay and Straw into Ireland from Great Britain prohibited.—The Department of Agriculture and Technical Instruction for Ireland have made an Order prohibiting the landing in Ireland of hay and straw brought from Great Britain. The Order was to come into operation on 9th March, and does not apply to (a) hay or straw which at the time of importation is being used for packing merchandise, (b) manufactured straw not intended for use as fodder or litter for animals, and (c) hay or straw which is authorised to be landed for use otherwise than as fodder or litter for animals by a licence granted by an Inspector of the Department.

Rabies Order in Northampton revoked.—The suspected case of rabies in Northampton, which was reported in the previous issue of this *Journal* (March, 1908, p. 757), has not, as a result of the bacteriological examination, been confirmed and the Board have accordingly revoked the Northampton and District (Muzzling and Control of Dogs) Order of 1908 as from the 3rd April, 1908.

Foot-and-Mouth Disease in Edinburgh.—The Board have now revoked all the local orders which were made in consequence of the recent outbreak of foot-and-mouth disease in Edinburgh.

Agricultural Statistics, 1907.—The Board have now issued Part II of Vol. XLII of the Agricultural Statistics [Cd. 3989. Price 4d.]. This publication contains statistics of the produce of the crops of Great Britain in 1907 with summaries for the United Kingdom, together with records of the weather conditions of the year, compiled from information collected by the Meteorological Office.

Utilisation of Canals for Agricultural Purposes.—The Board are informed that the Eleventh International Congress of Navigation will meet at St. Petersburg from 31st May to 7th June, 1908, and among the subjects under discussion will be the utilisation of canals for agricultural purposes, and the protection of low-lying regions against inundation. Communications should be addressed to the Secretary-General of the Congress, 7, Perspective Ismaïlovsky, St. Petersburg.

Bee Disease in Hertfordshire.—With reference to the outbreak of bee disease in the Isle of Wight which was investigated in 1907 (*Journal*, June, 1907, Vol. XIV, p. 129), the Board are informed of the occurrence of an apparently similar disease in several villages in the neighbourhood of Kings Langley, Herts. The investigations as to the disease in the Isle of Wight are being continued and this outbreak at Kings Langley will be included in the enquiry.

Fream Memorial Fund.—The Board of Agriculture and Fisheries have received from Mr. Martin J. Sutton and Sir George Barham, on behalf of the Dr. Fream Memorial Committee, of which the Earl of Jersey was the President, the sum of £200, the income from which will be applied to provide a prize of books to be competed for each year by students in the science of agriculture. So long as an examination is held by the National Agricultural Examination Board for the National Diploma in Agriculture, the prize will be awarded to the person who obtains the highest marks in that examination.

Owing to the generosity of an individual donor, the Board will be in a position to award a sum of £5 as a Fream Memorial Prize at the next examination for the Diploma.

The Board of Agriculture and Fisheries have been furnished by the Board of Trade with the following report, based on

212 returns from correspondents in
Agricultural Labour various districts on the demand for
in England agricultural labour in March:—
during March.

Employment was generally fair with farm
labourers in March. In most districts wet weather
caused a stoppage of outdoor work for a few days, and some day labourers
lost a little time. The supply of this class of men, generally speaking, was
quite sufficient for requirements.

Northern Counties.—Correspondents in *Northumberland* report that farm labourers were in regular employment during March, and that the supply of day labourers was equal to the demand. In *Durham*, stormy weather hindered sowing at the commencement of the month. A correspondent states that at the Newcastle hirings men for permanent situations, to be entered at May-day, were in good demand. In *Cumberland* and *Westmorland* some time was lost owing to storms of snow and rain, but work was plentiful turnip-cutting, threshing, draining and fence repairing affording ample occupation for day labourers. A correspondent in the *Cockermouth Union*

(Cumberland) reports that men for permanent situations were plentiful. Employment was fairly regular in *Lancashire* and *Yorkshire*, but the inclement weather somewhat affected outdoor work at the commencement of March. Day labourers were employed in threshing, potato sorting and hedging. In the Bridlington Union (Yorkshire) day labourers were scarce owing to public works in the district.

Midland Counties.—In *Cheshire* and *Derbyshire* rain interfered with outdoor work to some extent, but employment was plentiful. In *Nottinghamshire* threshing, hedging and ditching afforded fair employment to day labourers, and the supply of this class of men was equal to the demand. In the Basford Union a scarcity of men for permanent situations was reported. Employment was fair generally in *Leicestershire*, but wet weather in the latter part of the month caused some day labourers to lose time. In the Melton Mowbray Union the supply of men for permanent situations was reported to be short of the demand. In *Staffordshire* and *Shropshire* work was plentiful, but wet weather caused some loss of time. The supply of day labourers was equal to requirements. In *Worcestershire* and *Warwickshire* little time was lost, and day labourers were fairly well employed in threshing, hedging and ditching and assisting to feed stock. A scarcity of men to attend on stock was reported from the Shipston Union (Worcestershire). In *Northamptonshire*, *Oxfordshire* and *Buckinghamshire* the wet weather adversely affected employment, and some time was lost on outdoor work. Generally speaking there was not much demand for day labourers. The same conditions were reported with regard to *Hertfordshire* and *Bedfordshire*.

Eastern Counties.—In *Huntingdonshire* and *Cambridgeshire* wet weather hindered the sowing of spring corn and other outdoor work. The supply of day labourers was generally adequate. Work was plentiful in *Lincolnshire*, and in some Unions a scarcity of day labourers was reported. A full supply of men engaging for permanent situations at May-day was reported from the Grimsby Union. In *Norfolk* the supply of day labourers was about equal to the demand, and employment was not greatly interfered with by wet weather. In *Suffolk* and *Essex* outdoor work was somewhat hindered by the stormy weather, and day labourers were not in much demand. The supply of men for permanent situations was generally sufficient.

Southern and South-Western Counties.—Correspondents in *Kent* report that regular men were in fairly constant employment, but that day labourers lost a little time owing to the rain. The supply of the latter class of labour was in excess of requirements. In *Surrey* and *Sussex* similar conditions were reported. A scarcity of men for situations as carters and stockmen was reported from certain Unions. The unsettled weather caused some loss of time in *Hampshire* and *Berkshire*, where extra men were not much in demand. A scarcity of men for permanent situations was reported in the Andover Union. Employment in *Wiltshire* was fair on the whole, and day labourers were employed in threshing, ground dressing, hedging and ditching. A scarcity of men for tending stock was reported in the Mere and Chippenham Unions. In *Dorsetshire* wet weather delayed threshing and spring sowings to some extent, but day labourers were fairly well employed. In *Somersetshire* employment was fairly regular, and the supply of day labourers was adequate. In *Herefordshire* and *Gloucestershire* some little time was lost through rain, and the demand for day labourers was moderate. Some scarcity of men for permanent situations was reported from *Devonshire*. Day labourers were fairly well employed, and the supply was rather better than a year ago. In *Cornwall* the supply of labour was generally equal to requirements. In both counties some time was lost through wet weather.

The weather during the month of March was less genial and favourable than the weather in February. During the first week of the month the general condition was cold and unsettled, with frequent showers of snow and hail in the north and of rain or sleet in the south. Temperature was as a rule below the average. The rainfall was "heavy" in every part of the eastern

Notes on the Weather in March.

part of the British Isles, "very heavy" in England E. and N.E. At Marlborough on one day the snow lay 9 inches deep and yielded 1·12 in. of water. It is perhaps hardly necessary to add that bright sunshine was in many places "scanty" and in no place above the average in England. In Scotland, however, it exceeded the normal slightly. During the second week the weather was unsettled in all parts of the kingdom, but fine intervals were more frequent in the eastern, south-eastern and central counties of England than elsewhere and the falls of rain less heavy. Warmth was "moderate" everywhere except in Scotland W., where it was deficient. Rainfall and sunshine showed very little variation from the average. At this time, although the rainfall during the month was above the average, it was still below the normal for the year for most parts of England. During the third week the weather remained cold and generally cloudy with rather frequent falls of rain or snow during the earlier half. Warmth was everywhere "deficient" (Scotland E. "very deficient"), the deficit ranging from above 6° in most parts of England and 5½° in Scotland to 2° in Ireland. Rainfall and sunshine were both defective in most places. During the fourth week the weather continued very changeable with heavy falls of rain in most districts, especially in the middle of the week. The temperature was little if any above the average, but the thermometer rose to 61° in England E. In most districts rainfall was largely in excess, being "heavy" throughout Great Britain and "very heavy" in Scotland E. and W., England N.W. and Midlands. Sunshine was generally less than usual, but in England S.W. it was "abundant." In Scotland E., England N.E. and Midlands it was "scanty", in Scotland W. "very scanty." The season was now markedly backward. The number of accumulated day's-degrees above 42° was in every district considerably below the average, while the number of such degrees below 42° in excess not only for the season, i.e., 1st-25th March, but also for the year 29th December, 1907, to 28th March, 1908. This condition is remarked by all the Board's correspondents. In Kent the season is said to be about 10 days late; in Berkshire, where floods were also reported, all growth is said to have been stopped, the consumption of hay being heavy. The land is described as much sodden with wet and the trees as hardly showing a trace of life.

In North Lancashire the weather has not been favourable for lambing and farmers have been having an anxious time. Little corn was sown, and it has not been possible to get on with the work on the land. The last remark is also applicable in Kent, where lambing is said to have been satisfactory. Wheat did not look well.

Argentina.—The official estimate of the maize crop published by the Ministry of Agriculture on 6th March amounted to 3,456,000 tons (*Dornbusch*, 7th March).

Notes on Crop Prospects Abroad.

India.—The second general memorandum on the Indian wheat crop for the season 1907-08 (*Indian Trade Journal*, 12th March, 1908) covers the provinces which contain on an average 99·7 per cent. of the total reported area under wheat in India. The area sown

this year is estimated at 20,259,100 acres, a decrease of 8,240,700 acres or 29 per cent. as compared with the figures at this date last year. The native states of the Panjab, from which reports have not hitherto been received, report a total acreage of 750,500, and adding this to the figures stated above the total reported area of the present season comes to 21,009,600 acres, as against 28,499,800 acres last year. The decrease is generally attributed to deficiency of moisture in the soil owing to the early cessation of the monsoon and the prolonged drought of October-December. The winter rains, though late, have greatly improved the prospects of the crop which was reported at the date of the memorandum to be in fair to good condition in all the important wheat-growing provinces except Hyderabad and parts of Bengal and Bombay, but more rain was urgently needed, especially in the Panjab and Bengal.

Roumania.—According to the *Curierul Financier* the area under wheat this season is estimated at 4,291,000 acres as against 4,728,000 acres last year (*Dornbusch*, 27th March).

Live Stock in Spain.—There are stated to be 13,500,000 sheep and 2,500,000 cattle in Spain. Two flocks of pure-bred Oxford and one of Shropshire sheep were

started in 1905, and Shropshires and Oxfords have been

Miscellaneous Notes. crossed with Spanish sheep by breeders in various parts. Dutch and Swiss dairy cows are imported in considerable numbers for the milk supply of the larger towns. Some

experiments have also been made in crossing with shorthorn bulls, which promise satisfactory results. Spain is a great pig-breeding country, but British breeds have not met with great success. The official society of cattle breeders is the Asociacion de Ganaderos (Secretary, Marques de la Frontera, Huertas 30, Madrid). (*Foreign Office Reports, Annual Series*, No. 3957.)

Preservation of Eggs.—A solution for preserving eggs, which is reported to have given satisfactory results, is made up of 200 grammes silicate of soda, 2 grammes phosphate of soda, 2 grammes sugar, 600 grammes of water, and 200 grammes of 13 per cent. hydrochloric acid. It is necessary to mix the ingredients separately in order to prevent them forming a jelly; thus the soda and sugar should be mixed with one-third of the water in one vessel, and the acid with two-thirds of the water in another. The two solutions should then be poured over the eggs at the same time. Eggs preserved in this way were found perfectly fresh after 33 weeks, and the cost for small quantities was about 1½d. per 10 eggs. (*Wiener Land. Zeit.*, 18th January, 1908.)

Sheep in Russia.—Sheep breeding has much diminished in Russia in recent years, and the exports of wool, which amounted in 1891 to 90 million lb., fell in 1907 to 26,000,000 lb. The Russian Agricultural Department has accordingly appointed a Committee to deal with the question and consider measures to restore the industry to its former condition. (*Deut. Reichsanzeiger*, 31st January, 1908.)

Decreased consumption of Rye in Russia.—According to information gathered by the statistical section of the Moscow Town Council, a gradual transition from rye to wheat bread has been observed in the consumption of Moscow. The yearly import into that city during the seventies of the last century was on the average 2,250,000 cwts. of rye flour and 1,125,000 cwts. of wheat flour. During the five years, 1901-5, the quantity of rye flour was the same, but the amount of wheat flour had increased to 2,090,000 cwt., and in the interval the population of Moscow had increased by two-thirds. (*Dornbusch's List*, 8th February, 1908.)

Live Stock in the Azores.—The Board have received through the Foreign Office a report of Mr. Consul Read on the condition of agriculture in the Azores. It appears that there is no opening for the importation, except on a very unimportant scale, of live stock from the United Kingdom, as land is let, as a rule, in small holdings to farmers who have not the capital to pay heavy prices for pedigree

animals. Cattle are exported from the Islands to Lisbon and Madeira. Horses for cabs are relatively dear, and Mr. Read believes that one or two of the proprietors of the best carriage establishments would be glad to have some good English horses; the difficulty, however, is that they are ignorant of English, which deters them from going to England, and that they know of no reliable and competent person to act as interpreter and to assist them to purchase good serviceable animals at moderate prices.

Disinfection of Hides Imported into the United States.—The Board have received through the Foreign Office a statement that the Treasury Department of the United States have revoked the provisions as to the disinfection of hides contained in Circular No. 48, of 18th July, 1907, given in this *Journal* for October last (p. 438). In accordance with the provisions of Treasury Decision, No. 23,212, of 30th July, 1901, certificates of disinfection will be required upon the entry of all hides of meat cattle, when not dry-salted or arsenic cured. Dry hides which have been salted or arsenic cured, will be considered as having been disinfected by the process of curing, and need not be submitted to any further treatment. Dry hides which have not been salted or arsenic cured, and fresh or moist hides are to be disinfected according to a method prescribed.

Officers of the U.S. Customs are directed to treat hides of meat cattle shipped to the United States without proper disinfection as prohibited importations, and to refuse entry of such hides, including calf-skins, hide cuttings or parings, and glue stock, the product of meat cattle shipped from Europe, Africa, Asia, Australia and South America, except hides, parings, cuttings and such glue stock which have been dry-salted or arsenic cured or lime dried after soaking for forty days in a strong solution of lime, and except abattoir hides, the product of Sweden, Norway, and Great Britain, and hides taken from American cattle, killed in lairages in Great Britain, in all cases where the invoices are not accompanied by the proper certificates of disinfection issued by the American Consular Officers in the district from which such hides are imported, and the disinfection of such hides in the United States, or storage of the same in general order warehouse, will not be permitted, as the passage of diseased hides through the country or storage with other goods would tend to the dissemination of cattle disease.

Importation of English Cattle into Rhodesia.—The British South African Company has recently imported into North-Eastern Rhodesia twenty-two pure-bred bulls, viz., ten Polled Angus, seven Devons and three Shorthorns. The animals all arrived in good condition, and their cost, including transport, was a little over £50 each. (*Rhodesian Agricultural Journal*, December, 1907.)

Phosphates in the Marshall Islands.—An article published in the *Deutsche Kolonialzeitung* reports a discovery of phosphates in Nauen, one of the Marshall Islands. A company has been formed to work the deposits, the depth of which, however, is not yet ascertained. The output for 1908 is estimated at 75,000 tons. (*Board of Trade Journal*, 26th March, 1908.)

Frozen Lamb from Natal.—The Board of Trade Correspondent at Durban (Mr. A. D. C. Agnew) reports that a small trial shipment of Natal reared frozen lamb was recently sent to London. This is the first consignment of the kind from Durban to England, and it is hoped that in course of time a considerable trade may be done. A considerable number of sheep from Australia have lately been imported at Durban for the Transvaal, a similar importation being made last year for the Orange River Colony. According to the latest returns, there were 524,712 woolled sheep in Natal in possession of Europeans, 16,900 Persian sheep and 37,016 sheep available for slaughter. There were also 327 imported and 7,000 Colonial rams. The number of Kaffir sheep returned was 50,000 owned by Europeans and 200,000 (estimated) by natives. (*Board of Trade Journal*, 27th February, 1908.)

Grading of Maize in South Africa.—Regulations have recently been made

providing that all maize for export from South Africa, whether (1) handed to the Administrator for disposal through Agents in London, or (2) for disposal otherwise than through the Government Agent, but the Government undertaking the duties of Shipping Agent at the port of shipment (except Natal), will be graded by the Government Exporting Officer at the port of shipment, and maize not coming up to the standard will be Government marked (below grade). Consignments showing the slightest sign of weevil, either wholly or in part, will not be accepted for conveyance, and if found to be in a weevily condition before shipment will not be exported. In the case of maize for export over sea, *through private agents* at the respective ports, it is provided that all such maize must pass through the Government grader, otherwise full ordinary rates will apply. (*Board of Trade Journal*, 26th March, 1908.)

Hop-Growing in California.—The Board have received through the Foreign Office a despatch from Mr. Consul-General Hearn stating that the Sonoma County branch of the Pacific Hop-Growers' Association held a meeting on 14th March, at which it was agreed that the members should reduce their acreage under hops for the present season for the benefit of the future of the industry. Hop-growers in certain valleys in Shasta County are discouraged by the outlook for hops, and a number of them announce their intention of rooting-up their plantations and devoting the land to more profitable crops.

REVIEW OF MARKET PRICES IN MARCH.

A. T. MATTHEWS.

In presenting a general review of the markets of the month, based on the quotations and information collected by the Board's market reporters,* it will be perhaps convenient to adopt the plan of treating the subject in the first instance week by week, and to conclude with some remarks summarising the whole position.

The markets selected for the purpose of the weekly returns of prices are chosen not only for their individual importance, but also for their geographical position, the object being, by a fair distribution of centres, to obtain a comprehensive survey of the trade of the whole country. It may therefore happen that occasional reference may be made to transactions at a comparatively small market which may be representative of a large agricultural district having within its area several similar market centres.

First Week.—The first week in March found trade in fat cattle remarkably steady, values being fully equal to those of

* The return of market prices issued by the Board is to be obtained from Wyman & Sons, Ltd., Fetter Lane, E.C.; Oliver & Boyd, Edinburgh; or E. Ponsonby, 116, Grafton Street, Dublin. Price, 1d. (by post 1½d.) or a copy will be sent regularly as issued, by the publishers, for three, six or twelve months, on payment of a subscription, including postage, at the rate of 6s. 6d. per annum.

Christmas and about $\frac{1}{2}d.$ per lb. higher than those prevailing in the late autumn. During the week the top price in London was $6\frac{3}{4}d.$ per lb., this being exceeded at several country markets by $\frac{1}{2}d.$ per lb.

The trade for fat sheep, which for so long a time has been remarkably steady, has shown a certain want of animation, owing largely to the fall in the value of skins, but apart from this consideration mutton itself has remained fully as dear as last year. In the first week of March, 1907, the highest quotation for Down tegs at Islington was $9\frac{1}{2}d.$ per lb., and this was about the average price returned for the whole country this year; although at Derby $9\frac{1}{2}d.$ was actually paid for sheep by weight, and at Salford the estimated price of $10d.$ was returned.

There was very little demand for lambs in London early this season, and the half-bred Dorsets were very slow of sale. At the first March market, lambs were quoted at Islington at $10d.$ per lb., while at Leicester they were fetching $1s. 0\frac{1}{2}d.$ and at Salford and Wolverhampton as much as $14d.$

In the dead-meat market at Smithfield there are seldom any striking fluctuations from week to week, although many small ones are of daily occurrence, and the same may be said of dead meat in the large provincial markets. March began with Scotch sides of beef at $56s.$ per cwt. in London, $58s. 4d.$ in Glasgow, $53s. 8d.$ in Edinburgh, and $56s.$ at Dundee for first quality. While English sides were $52s. 6d.$ in London, and $53s. 8d.$ at Birmingham, Leeds and Manchester. Port-killed beef usually fetches as much in London as the best English, and the first March quotation was exactly the same, but at Manchester it was $2s. 4d.$ per cwt. less. There are often curious variations in the relative values of chilled beef. For the week in question American hindquarters were $51s. 4d.$ in London against $52s. 6d.$ in Leeds and $53s. 8d.$ at Glasgow; forequarters, of course, being far less valuable. Frozen New Zealand fore and hind quarters averaged about $29s.$ per cwt., and Australian and Argentine a trifle less.

Carcase mutton was dearer in proportion than fat sheep at London, which is seldom the case in this market. Small Scotch tegs were exceptionally dear, and $9d.$ per lb. was obtained in London, Liverpool and Manchester. In London the small tegs from Holland compete strongly with Scotch during winter, but the

supply of these having ceased for the season there was a corresponding increase in the demand for Scotch. Best English tegs sold as high as 8d. per lb., which was 1d. higher than the corresponding week of last year, but this price was restricted to very small carcases, and those exceeding 72 lb. fetched only 7d. per lb. A very few Down lambs from Wallingford, weighing about 32 lb., realised 1s. 2d. per lb., but early and heavy Dorset half-breds were slow of sale at 10d.

Dutch veal at London reached $7\frac{3}{4}$ d. per lb. and English only $7\frac{1}{2}$ d., but a large proportion of second and third qualities of the former was sold at 6d. and even 5 $\frac{1}{2}$ d. A few prime small Dutch will often fetch 1d. per lb. more than the best English at this market, but it ought to be understood that this superiority extends to only a very limited number of carcases, and, if a fair average could be struck, there is no doubt that the advantage would be with home produce.

In the face of heavy supplies during the whole of the winter pork has been depressed, and prices, compared with those of last year, were lower on 5th March by about 1d. per lb.

Our review of the provision trade commences with an abnormal condition of the markets for butter. February had witnessed an excitement which, springing from reports of a great shortage, had forced up the price of colonial butters about 30s. per cwt., and holders were seized with panic. The trade was for a time demoralised, but prices rapidly fell to their old level, and in about a fortnight, the quotations went down from 152s. to 120s. for colonial produce, at which they stood when March came in. English butter was only affected to a small extent by these fluctuations, which, after all, appear to have been quite uncalled for by the real position, and were confined largely to wholesale and speculating dealers.

In contrast with butter, cheese has been very steady for some time past at a fairly good price. The month opened with best Cheddar worth 76s. per cwt. in London and 74s. at Bristol, while Cheshire was selling in Liverpool at 78s. to 70s. per 120 lb., and best Canadian at 64s. 6d.

Bacon during the last few months has fluctuated from week to week, but the tendency has been to a steady shrinkage in values till, at the beginning of the month, they stood at 12s. to 15s. reduction for foreign and 5s. for Irish as compared

with 7th March last year. The trade in English bacon in London is of a retail character, but it was quoted in Bristol at 70s. for dried and 64s. for green, against 48s. at the former place for green Danish. Thus English bacon is shown to retain a far superior place in the estimation of consumers.

Second Week.—At this time of year Islington cattle market shows very little variety of breeds, the supply being almost entirely confined to Shorthorns, or cattle which are so described as being crosses or grades of that breed. The quality of the Norfolk fed bullocks is excellent owing to the first rate feeding for which East Anglia is justly celebrated. For such quality the trade in the second week of March was very firm, and 6 $\frac{3}{4}$ d. per lb. was easily obtainable in London, while at six other English markets this was slightly exceeded. The week showed a weaker demand for second quality animals. Fat sheep were very firm, and prime small tegs were worth a little more money in some markets, but 80-lb. sheep were slow of sale.

There was scarcely any alteration in the prices of dead meat at the Central Market, but complaints were numerous of the slackness of demand.

The butter trade showed more confidence, and a slight recovery in the value of Danish and colonial took place at London and Glasgow. There was no quotable alteration in cheese, and very little in bacon, although American was slightly cheaper.

Third Week.—The supplies of fat cattle were fairly good, and prices were virtually unchanged; 805 head were offered in London, and 6 $\frac{3}{4}$ d. per lb. remained the top price. More than double the above number were shown at Salford and Newcastle, and Leeds, Norwich, Wakefield and Glasgow also exceeded the London supply. The supply of sheep in London was 6,770, which was the largest in Great Britain. Trade for mutton was slow but firm, especially for the smaller breeds. Veal calves were in good demand during the week, the best making 9d. per lb. dead-weight.

Scotch and English beef at Smithfield fetched the same price as the previous week, and prices all round showed scarcely any change.

Butter again showed weakness, and London prices receded to the extent of 5s. per cwt. for Danish, 2s. for Australian, and 4s. for New Zealand, while French was 4s. up. Cheese was

firm, and bacon was a better trade, Irish advancing 5s. and Danish 1s. per cwt.

Fourth Week.—After many weeks of uniformity in the top price of Norfolk cattle at Islington, prices on the 23rd gave way to the extent of $\frac{1}{2}d.$ per lb., and $6\frac{1}{2}d.$ was all that could be obtained for the choicest quality. As is frequently the case, Islington followed Deptford, and on that day the arrivals of States cattle were in excess of the somewhat restricted demand.

Beef in the country generally, however, may be regarded as having maintained its value for the week ending 26th March.

Sheep were a very slow trade in London on the 23rd at a general reduction of about 1s. 6d. per head. There was also some want of animation at the majority of the provincial markets. Four of the 27 markets were reported dearer, while 8 were cheaper, the remainder being firm and unchanged. This scarcely applies to clipped sheep, of which a good many were on offer. For these the buyers showed a decided preference, the state of the wool market having checked the demand for unshorn sheep. Lambs are now coming forward in much larger numbers and showing better quality. Small Downs fetched 1s. per lb. at London and up to 1s. 2d. at Newcastle.

There was no noticeable change in the carcase trade during the week, sellers of all kinds of meat complaining of the very poor demand.

The trade for butter again gave way, and the month closed with rather serious reductions in value. At London Australian declined 8s. per cwt., New Zealand 6s., French 8s. and Danish 2s. Cheese remained firm and bacon steady, with a slight advance in American.

Latest Markets.—At Norwich on Saturday, 28th March, there was a moderate supply of beef cattle, and buyers attended Islington on the 30th to fill up their requirements. The result was a good trade at an advance of $\frac{1}{2}d.$ per lb.; good Norfolks fetching 7d. per lb.

Sheep, although in moderate supply, met a slow trade, with no advance in values.

General Remarks.—On the whole the month of March has been characterised by no sudden or serious fluctuations in the values of beef and mutton, indeed they have been remarkably steady, and much the same as those of last year in spite of the very

frequent reports of slowness in demand. It seems fair to assume that mutton would have shown improvement had it not been for the reduced value of wool. There has been more change in the value of provisions, but the fluctuations have been by no means uniform in character. While bacon has experienced a decided fall, butter, in spite of the recent curious excitement, is worth more at the present moment than it was a year ago. Cheese is somewhat lower. Milk is exceedingly firm in value, and although during the winter there have been times of scarcity, notwithstanding the abundance of fodder, and summer contracts are being made at some advance on last year's rates. Our dairy farmers have therefore little to complain of at the moment, and will commence the grazing season with cheerful prospects. That considerable confidence is felt in the future of this branch of British agriculture is shown by the continued excellent demand and good prices for all dairy cows with any pretensions to being good milkers. These are as dear now as they were in the days when their beef value, when sold, was many pounds higher than it is now.

Store cattle, especially those old enough for finishing, are very dear, and the trade during the month has continued very firm. Prices, in fact, are too high for a quick trade, the margin of possible profit for feeding being obviously rather narrow. Store sheep are being bought with caution, and little is doing in them at present in English markets. In Scotland, however, there is more life in the trade, and at Inverness on the 25th March no less than 17,000 changed hands at about last year's prices, notwithstanding the fall in wool and pelts.

The wool trade has shown weakness during the month and values have receded from the highest point of last year to a considerable extent. The bi-monthly sales of foreign and colonial wool which last about a fortnight took place at the end of March, opening with less spirit on the part of buyers than has been seen for several years. For several days this depression tended to increase till the fall in cross-breds amounted to something like 15 per cent. compared to the last sale. Towards the close of the series, however, a reaction set in and the sales ended with a much better tone, a good deal of the above reduction being recovered. This points to the existence of a healthier consumptive demand than might be supposed.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND
in the Month of March, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—				
Cattle :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Polled Scots ...	s. d.	s. d.	s. d.	s. d.
Herefords ...	8 0	7 6	37 10	34 8
Shorthorns ...	7 10	7 5	—	—
Devons ...	7 9	7 2	36 9	34 1
Veal Calves ...	8 1	7 3	—	—
per lb.*	d.	d.	per lb.*	per lb.*
Veal Calves ...	8 $\frac{1}{4}$	7 $\frac{1}{4}$	8 $\frac{1}{4}$	6 $\frac{1}{4}$
Sheep :—				
Downs ...	9 $\frac{1}{2}$	8 $\frac{1}{2}$	—	—
Longwools ...	9	8	—	—
Cheviots ...	9 $\frac{1}{2}$	9	9 $\frac{1}{2}$	8 $\frac{1}{2}$
Blackfaced ...	9 $\frac{1}{2}$	8 $\frac{1}{2}$	8 $\frac{1}{2}$	7 $\frac{1}{2}$
Cross-breds ...	9 $\frac{1}{2}$	8 $\frac{1}{2}$	9 $\frac{1}{2}$	8 $\frac{1}{2}$
Pigs :—	per stone.*	per stone.*	per stone.*	per stone.*
Bacon Pigs ...	s. d.	s. d.	s. d.	s. d.
Porkers ...	6 1	5 8	6 4	5 7
Porkers ...	6 7	6 2	6 7	5 11
LEAN STOCK :—				
Milking Cows :—	per head.	per head.	per head.	per head.
Shorthorns—In Milk ...	£ s.	£ s.	£ s.	£ s.
" —Calvers ..	21 0	18 0	21 7	18 7
Other Breeds—In Milk ..	20 15	18 2	20 10	17 6
" —Calvers ..	18 3	13 12	18 13	15 8
" —Calvers ..	16 15	12 15	19 4	15 17
Calves for Rearing ...	2 3	1 14	2 16	1 16
Store Cattle :—				
Shorthorns—Yearlings ...	9 12	8 7	10 12	8 4
" —Two-year-olds ...	14 1	12 6	15 10	13 11
" —Three-year-olds ..	16 12	14 17	17 10	14 15
Polled Scots—Two-year-olds	—	—	16 3	14 1
Herefords— "	15 1	13 12	—	—
Devons— "	14 10	12 17	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs, and Lambs—				
Downs or Longwools ...	47 11	43 2	—	—
Scotch Cross-breds ...	—	—	36 9	32 2
Store Pigs :—				
Under 4 months ...	22 7	17 1	21 11	17 9

* Estimated carcass weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of March, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birming-	Man-	Liver-	Glas-	Edin-
		cwt.	ham.	chester.	pool.	gow.	burgh.
BEEF :—							
English	1st	52 0	52 6	53 6	—	56 6*	55 0*
	2nd	50 6	48 6	49 0	—	53 0*	50 0*
Cow and Bull ...	1st	39 0	46 0	46 6	42 0	46 0	44 6
	2nd	35 0	41 6	42 0	37 6	37 6	36 0
U.S.A. and Canadian :—							
Port Killed ...	1st	52 0	51 0	50 6	51 6	51 6	50 6
	2nd	49 6	47 6	48 6	46 6	49 0	49 0
Argentine Frozen—							
Hind Quarters ...	1st	31 0	32 6	31 6	31 6	32 6	32 6
Fore ,,,	1st	26 6	27 0	26 0	25 6	28 0	28 0
Argentine Chilled—							
Hind Quarters ...	1st	41 0	40 6	41 0	41 0	—	43 0
Fore ,,,	1st	29 6	29 6	29 0	28 0	—	31 6
American Chilled—							
Hind Quarters ...	1st	53 0	54 0	52 6	52 6	55 0	54 0
Fore ,,, ...	1st	35 6	36 6	35 6	35 6	37 6	37 6
VEAL :—							
British	1st	70 0	70 0	73 6	77 6	—	—
	2nd	65 6	57 6	65 6	73 0	—	—
Foreign	1st	72 6	—	60 6	64 0	—	70 0
MUTTON :—							
Scotch	1st	80 6	72 6	84 6	84 0	76 6	70 6
	2nd	72 6	58 6	79 6	79 6	65 6	59 0
English	1st	72 6	71 6	80 0	77 0	—	—
	2nd	65 6	60 0	74 6	71 0	—	—
U.S.A. and Canadian—							
Port killed ...	1st	—	69 0	74 6	74 0	—	—
Argentine Frozen ...	1st	34 0	34 6	34 0	34 0	30 6	33 0
Australian ,,,	1st	32 0	32 6	31 6	31 6	30 6	—
New Zealand ,,,	1st	41 0	38 0	—	—	—	—
LAMB :—							
British	1st	118 0	—	—	—	—	—
	2nd	102 6	101 0	—	—	—	—
New Zealand ...	1st	57 6	57 6	57 0	57 0	60 6	—
Australian ...	1st	45 6	48 0	42 0	42 0	46 0	46 6
Argentine ...	1st	42 0	45 6	43 6	43 6	42 6	44 6
PORK :—							
British	1st	54 0	58 6	59 6	57 6	52 6	51 6
	2nd	49 0	51 6	55 6	53 6	50 0	42 0
Foreign	1st	53 0	49 6	49 0	49 0	—	—

Scotch.

AVERAGE PRICES of British Corn per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act 1882, in each Week in 1906, 1907 and 1908.

Weeks ended (in 1908).	Wheat.			Barley.			Oats.		
	1906.	1907.	1908.	1906.	1907.	1908.	1906.	1907.	1908.
Jan. 4	28 4	26 0	35 1	24 6	23 11	26 9	18 2	17 3	18 4
" 11	28 6	26 1	35 2	24 8	24 2	26 9	18 4	17 4	18 3
" 18	28 5	26 1	35 5	24 11	24 1	27 1	18 4	17 5	18 5
" 25	28 7	26 2	35 6	25 1	24 5	26 11	18 7	17 5	18 5
Feb. 1	28 10	26 3	35 0	25 1	24 4	26 11	18 10	17 5	18 4
" 8	28 10	26 6	34 3	25 3	24 5	26 9	18 10	17 7	18 3
" 15	28 11	26 7	33 1	25 6	24 1	26 9	19 0	17 7	18 0
" 22	28 10	26 10	32 6	25 4	24 2	26 5	19 0	17 9	17 11
" 29	28 8	26 9	30 11	25 0	24 2	26 3	19 0	17 9	17 8
Mar. 7	28 5	26 8	30 5	25 1	23 11	26 1	18 8	17 11	17 8
" 14	28 5	26 10	31 3	24 8	24 2	26 0	18 10	18 0	17 10
" 21	28 4	26 10	31 7	24 4	24 0	26 2	18 8	18 1	17 11
" 28	28 3	26 8	31 4	24 5	23 9	25 10	18 11	18 2	17 10
Apl. 4	28 7	26 9	31 3	24 2	24 3	25 5	18 11	18 3	17 9
" 11	28 11	26 8		24 4	23 9		19 4	18 6	
" 18	29 4	26 8		24 0	23 3		19 1	18 7	
" 25	29 6	26 10		24 0	23 3		19 6	18 9	
May 2	29 10	27 0		23 10	23 6		19 9	19 3	
" 9	30 1	27 6		24 1	24 0		20 0	19 7	
" 16	30 3	28 4		23 10	23 10		20 1	20 1	
" 23	30 4	29 7		24 2	24 3		20 2	20 5	
" 30	30 4	31 4		22 10	24 0		20 5	20 8	
June 6	30 3	32 0		23 4	24 7		19 11	20 7	
" 13	30 4	31 10		23 6	24 7		20 2	20 11	
" 20	30 5	31 4		22 10	24 11		20 2	20 9	
" 27	30 3	31 2		24 3	24 6		20 1	20 8	
July 4	30 2	31 3		23 0	24 8		20 2	20 11	
" 11	30 5	32 0		23 8	24 10		20 4	20 11	
" 18	30 3	32 6		23 2	24 6		20 5	21 1	
" 25	30 5	32 11		22 4	27 3		20 2	20 8	
Aug. 1	30 9	33 2		22 1	26 4		19 3	21 2	
" 8	30 5	33 5		23 0	26 6		17 11	21 3	
" 15	29 0	33 6		24 2	25 9		17 0	20 4	
" 22	27 9	33 7		25 0	25 0		16 10	19 8	
" 29	26 9	33 10		24 3	24 6		16 6	18 11	
Sept. 5	26 4	31 11		24 9	24 2		16 3	17 7	
" 12	25 11	31 4		24 3	24 4		16 1	17 6	
" 19	25 9	31 5		24 3	25 0		16 0	17 6	
" 26	25 9	31 8		24 8	25 3		16 2	17 8	
Oct. 3	26 1	32 6		25 0	25 5		16 3	17 9	
" 10	26 3	33 3		25 3	25 9		16 7	17 11	
" 17	26 5	34 4		24 10	26 3		16 8	18 0	
" 24	26 7	35 9		24 10	27 2		16 10	18 7	
" 31	26 7	36 3		24 8	27 7		16 11	18 10	
Nov. 7	26 6	35 10		24 8	27 8		17 1	18 10	
" 14	26 4	35 1		24 4	27 8		17 2	18 8	
" 21	26 3	34 7		24 1	27 5		17 3	18 9	
" 28	26 1	34 7		24 1	27 5		17 2	18 7	
Dec. 5	26 1	34 7		24 1	27 1		17 4	18 6	
" 12	26 1	34 8		23 11	27 0		17 3	18 5	
" 19	26 3	34 9		24 3	27 1		17 3	18 3	
" 26	26 0	34 6		24 1	26 10		17 3	18 0	

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates: Wheat, 60 lbs.; Barley, 50 lbs.; Oats, 39 lbs. per Imperial Bushel.

AVERAGE PRICES of Wheat, Barley, and Oats per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

	WHEAT.		BARLEY.		OATS.		
	1907.	1908.	1907.	1908.	1907.	1908.	
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	
France :	February ...	39 7	39 3	26 7	25 11	22 11	20 3
	March ...	40 0	39 0	26 8	25 11	22 11	19 11
Paris :	February ...	40 2	39 4	26 10	26 2	22 8	19 8
	March ...	40 0	38 5	27 3	26 2	23 0	19 6
Belgium :	January ...	28 9	34 7	25 0	26 7	19 5	21 5
	February ...	28 5	34 5	25 3	26 4	20 0	20 10
Germany :	February ...	39 0	44 9	28 9	29 6	23 9	22 8
	March ...	39 7	44 5	28 7	29 1	24 5	22 4
Berlin :	January ...	38 5	47 4	—	—	23 5	23 9
	February ...	39 8	45 5	—	—	24 6	23 0
Breslau :	January ...	36 10	46 6	29 0 (brewing)	31 3 (brewing)	20 10	21 4
				22 10 (other)	27 9 (other)		
	February ...	36 11	44 7	29 1 (brewing)	33 0 (brewing)	22 1	20 11
				22 10 (other)	27 9 (other)		

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets. The mark is now taken as equal to 11·8d., and the German prices for the former year have been recalculated on this basis.

AVERAGE PRICES of British Wheat, Barley, and Oats at certain Markets during the Month of March, 1907 and 1908.

	WHEAT.		BARLEY.		OATS.	
	1907.	1908.	1907.	1908.	1907.	1908.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London...	28 1	32 4	23 9	26 7	18 10	18 11
Norwich ...	26 5	31 6	24 0	26 6	17 6	17 11
Peterborough ...	25 10	30 10	22 7	24 9	17 3	17 6
Lincoln... ...	26 4	30 5	23 8	26 2	17 5	17 6
Doncaster ...	26 2	29 6	24 2	26 4	17 11	17 8
Salisbury ...	26 7	30 5	23 0	24 10	17 11	16 7

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of March, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Bristol.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
BUTTER :—	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
British ...	per 12 lb. 15 0	per 12 lb. 13 9	per 12 lb. 15 6	per 12 lb. 14 6	per 12 lb. —	per 12 lb. —	per 12 lb. 14 9	per 12 lb. —
Irish Creamery " Factory	—	—	—	—	—	—	—	—
Danish ...	123 6	121 6	—	—	122 6	120 0	121 0	—
Russian ...	115 0	112 6	—	—	113 0	109 0	—	—
Australian ...	117 6	114 6	119 0	114 6	117 0	114 0	117 0	111 0
New Zealand	119 6	117 0	121 6	118 6	119 6	117 0	118 0	—
CHEESE :—								
British—								
Cheddar ...	75 6	72 0	74 0	64 0	74 0	70 0	70 0	63 0
Cheshire ...	—	—	—	—	120 lb. 79 6	120 lb. 71 6	—	—
Canadian ...	66 0	65 0	64 6	62 0	64 6	63 0	65 0	62 0
BACON :—								
Irish ...	57 0	52 6	—	—	57 0	52 6	59 0	56 0
Canadian ...	44 0	42 6	46 6	43 0	44 0	40 6	46 0	43 6
HAMS :—								
Cumberland ...	95 6	80 6	—	—	—	—	—	—
Irish	88 6	79 6	—	—	—	—	82 0	73 6
American (long cut) ...	44 6	42 6	44 0	40 6	41 6	38 0	41 6	40 0
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British ...	9 4	8 1	7 11	—	—	—	—	—
Irish ...	8 8	7 7	8 1	7 7	7 11	7 4	7 10	6 9
Danish ...	8 11	7 6	—	—	8 1	—	7 10	7 0
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Langworthy ...	110 0	100 0	105 0	100 0	105 0	100 0	85 0	80 0
Main Crop ...	108 6	100 0	108 6	100 0	105 0	100 0	—	—
Up-to-Date ...	105 0	95 0	105 0	90 0	80 0	75 0	80 0	75 0
HAY :—								
Clover ...	94 6	83 6	75 0	—	90 0	67 0	75 0	69 6
Meadow ...	78 0	61 0	67 6	—	—	—	54 6	49 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	MARCH.		3 MONTHS ENDED MARCH.	
	1908.	1907.	1908.	1907.
Swine-Fever :—				
Outbreaks	147	152	398	475
Swine Slaughtered as diseased or exposed to infection ...	855	1,009	1,906	2,470
Anthrax :—				
Outbreaks	92	88	317	255
Animals attacked	112	115	436	327
Foot-and-Mouth Disease :—				
Outbreaks	—	—	3	—
Animals attacked	—	—	112	—
Glanders (including Farcy) :—				
Outbreaks	66	69	210	242
Animals attacked	214	144	711	552
Sheep-Scab :—				
Outbreaks	93	61	571	345

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	MARCH.		3 MONTHS ENDED MARCH.	
	1908.	1907.	1908.	1907.
Swine-Fever :—				
Outbreaks	11	8	40	41
Swine Slaughtered as diseased or exposed to infection ...	302	166	953	734
Anthrax :—				
Outbreaks	1	—	3	—
Animals attacked	4	—	6	—
Glanders (including Farcy) :—				
Outbreaks	—	—	—	—
Animals attacked	—	—	—	—
Sheep-Scab :—				
Outbreaks	30	19	220	130

 SELECTED CONTENTS OF PERIODICALS.

Journal of Bath and West and Southern Counties Society. Fifth Series. II.

The Sheep Stocks of the World, *A. T. Matthews*; Prospects for Small Holders, *W. E. Bear*; Large and Small Holdings in Denmark, *G. E. Lloyd Baker*; Some Faults and Fallacies in Dairying, *F. J. Lloyd*; British Forestry, *W. R. Fisher*; Dairy Farming: Fifty Years ago and now, *J. P. Sheldon*; The International Dairy Congress, *G. E. Lloyd Baker*; Interim Report of an Experiment for Ascertaining the Influence of Various Manures upon the Production of Mutton, *W. Ashcroft*; The Society's Experiments for the Improvement of Permanent Pasture, *E. A. Rawlence*.

Bulletin Mensuel de l'Office de Renseignements Agricoles. January, 1908.

Rapport sur les résultats obtenus par la commission d'études pour la détermination de la dose d'ergot à tolérer dans l'avoine algérienne, *M. Kaufman*; Italie, Action de l'électricité sur la végétation; Portugal, Moyens employés par le Gouvernement pour favoriser la production et la vente des produits agricoles, notamment en vue de l'exportation.

Arbeiten aus der K. Biologischen Anstalt für Land- und Forstwirtschaft. VI. I.

Beiträge zur Kenntnis der Kartoffelpflanze und ihrer Krankheiten, II, *Otto Appel*; Über *Phalacrus corruscus* als Feind der Brandpilze des Getreides und seine Entwicklung in brandigen Ahren, *Karl Friederichs*; Zur Aetiologie der sogenannten Faulbrut der Honigbienen, *A. Maassen*.

Die landwirtschaftlichen Versuchs-Stationen, LXVIII. 1 und 2.

Versuche über die Verdauung verschieden grosser Futtermengen durch Schweine, *T. Katayama*; Untersuchungen über die Zusammensetzung und Verdaulichkeit des auf Rieselböden gewonnenen Grasheues, *J. Volhard*; Einige Mitteilungen über die Zusammensetzung des Heues von Spüljauchen-Rieselwiesen und die Frage der Fütterung von phosphorsaurem Kalk, *P. Ehrenberg*; Untersuchungen über die Verdaulichkeit getrockneter Kartoffeln, *O. Kellner*; Verhandlungen der xxiv Hauptversammlung des Verbandes, Dresden, 14 September, 1907.

Landwirtschaftliche Jahrbücher. XXXVII. 1.

Frankreichs landwirtschaftliche Gesetzgebung.—*L. Rudloff*; Untersuchungen über den Einfluss des Tränkens und des Salzens des Futters auf die Veränderungen des Körpergewichtes und auf den Wassergehalt der Organe, *Koloman Farkas*; Fütterungsversuche mit Melasse, *S. Weiser* und *A. Zaitschek*; Über die Verteilung des Lebendgewichtes auf die Organe beim Huhn, *A. Zaitschek*.

Naturwissenschaftliche Zeitschrift für Forst- und Landwirtschaft. VI. 2.

Beiträge zur Kenntnis der Biologie holzzerstörender Pilze, *C. Rumbold*; Über die Bedeutung von Beerensfarbe und Beerenschleim bei der Mistel, *Viscum album*, *C. von Tubeuf*.

Zeitschrift für Forst- und Jagdwesen. XL. 2.

Das Wachstum von Kiefern aus einheimischem und nordischem Saatgut in der Oberförsterei Eberswalde, *Dr. Dengler*.

Föhling's Landwirtschaftliche Zeitung, 57.

2. Die Entwicklung und Leistungen der deutschen landwirtschaftlichen Genossenschaften, *C. Neumann*.
3. Die Sortenwahl beim Kartoffelbau, *Th. Kemn*; Europas Kartoffelbau in Gefahr, *Graf Arnim-Schlagenthin*.
4. Die systematische Einteilung und Benennung der Getreidesorten für praktische Zwecke, *C. Fruwirth*; Der Gehalt der Atmosphäre an gebundenem Stickstoff, *P. Vageler*.
5. Über die Keimreife der Gerste, *L. Kiessling*.

ADDITIONS TO THE LIBRARY.

[NOTE.—The receipt of annual publications of foreign agricultural and other departments, experiment stations and societies is not noted in the monthly list of additions to the Library, but a list of all such publications, which are regularly received, will be given from time to time.]

Great Britain—

Verrall, G. H.—British Flies : Syrphidae, &c. (691 pp.) Catalogue of the Platypodidae of the European District. (12 pp.) [in one volume.] London : Gurney and Jackson, 1901. £1 11s. 6d. net.

Sutton, Martin J.—Permanent and Temporary Pastures. Popular Edition. (156 pp.) London : Simpkin, Marshall, 1908. 1s.

Mourant, Ph. L. S.—“The Dairy Queen—The Jersey Cow.” (87 pp.) Jersey : Bigwood, 1907.

MacDonald, Jas.—Stephens' Book of the Farm, 5th Edition, in 3 Volumes. Div. I. Land and Its Equipment. (260 pp. + 8 plates). London : Blackwood, 1908. 10s. 6d. net.

Robertson, F. D. S.—Practical Agricultural Chemistry. (210 pp.) London : Baillière, Tindall and Cox, 1907. 7s. 6d. net.

Clarke, S. W.—The Law of Small Holdings in England and Wales. (284 pp.) London : Butterworth & Co., 1908. 5s. net.

Sowerby, James.—English Botany ; or, Coloured Figures of British Plants. 20 vols. 1800-5.

Parson, G. H.—Types of Modern Shires. (62 plates.) Alsager, Stoke-on-Trent : Harold Simms, 1907.

“Home Counties.” The Case for the Goat. (162 pp.) London : Routledge, 1908. 3s. 6d.

The Townsman's Farm. (304 pp.) London : Cassell & Co., 1908. 6s. net.

Collinge, W. E.—Report on Injurious Insects and other Animals observed in the Midland Counties during 1907. (58 pp.) Birmingham : Cornish Bros., 1908. 2s. 6d.

Butler, A. G.—Birds of Great Britain and Ireland. Order Passeres. Vol. I. (210 pp. + 60 coloured plates.) London : Caxton Publishing House, 19—.

Voorhees, E. B.—Forage Crops. (384 pp.) London : Macmillan, 1907. 6s. 6d. net.

McDonald, D.—Agricultural Writers, 1200-1800. (228 pp.) London : Horace Cox, 1908. 21s. net.

France—

Barsacq, J.—Le Ver des Pommes. (112 pp.) Paris : Librairie Horticole, 1906.

Mercier, F., et Dubos, E.—Manuel Juridique des Maladies Contagieuses des Animaux Domestiques. 2^e Édition. (606 pp.) Paris : Marchal et Billard. 1907.

Germany—

Lafar, Dr. F.—Handbuch der Technischen Mykologie (in 5 Vols.). Vols. I, III and IV. (749 + 503 + 558 pp.) Jena : Gustav Fischer, 1904-7.

Miehe, Dr. Hugo.—Die Selbsterhitzung des Heus. (127 pp.) Jena : Gustav Fischer, 1907.

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THE JOURNAL OF THE BOARD OF AGRICULTURE.

Vol. XV. No. 2.

MAY, 1908.

THE CENSUS OF PRODUCTION AND AGRICULTURE.

Under the Census of Production Act, 1907, the Board of Trade are charged with the duty of collecting special returns of the total output of the various industries of the United Kingdom, and by arrangement with that department the Board of Agriculture and Fisheries have undertaken to furnish the fullest possible information relating to Agriculture in Great Britain, in 1908.

For this purpose it is necessary to obtain data with regard to certain points not ordinarily included in the annual Agricultural Returns. It is contemplated that much of the desired information will be obtained by means of special inquiries, but by the addition of a supplementary schedule to the ordinary schedule, the co-operation of farmers is invoked to assist the Board to supply reliable estimates, where complete returns are not obtainable, of the total production of the land of the country. All information furnished to the Board is, of course, regarded as strictly confidential, and the returns of individual farmers will not, under any circumstances, be revealed. It is hoped that all occupiers of land who receive the schedules will realize the importance of assisting in the attempt to supply, for submission to Parliament, complete details of the output of British Agriculture.

The supplementary schedule referred to, which, with the ordinary schedule, is to be filled up on the 4th June next, deals with six points which have been carefully chosen as affecting the largest number of occupiers of land, and

providing the greatest amount of information when utilised in connection with the annual returns, and with the special enquiries which the Board propose to undertake.

(1) *Breeds of Live Stock.*—Stock-owners will be asked to state the breeds of the cattle, sheep, pigs, and horses kept by them, and whether they are “pure-bred,” i.e., entered, or eligible for entry, in a breed register, or otherwise. If they are not pure-bred, their type or general character is to be stated, as, for example, in the case of cattle, “Shorthorn type,” “Jersey type,” etc. The absence of definite knowledge as to the proportionate numbers of the many different classes of stock in the country has been frequently brought to the notice of the Board, and the data which it is hoped to obtain by means of this return will be of material assistance in connection with calculations of the output of meat, dairy produce, wool, &c.

(2) *Poultry.*—Returns are asked for of the number of fowls, ducks, geese, and turkeys, kept on the holding. Representations have in recent years been repeatedly made to the Board in favour of obtaining statistics relating to the progress of poultry-keeping, but some hesitation has been felt in view of the comparative failure of the efforts in this direction made in 1885–6. It is believed, however, that the greatly-increased importance now attached by farmers to this branch of agricultural production will induce them to appreciate more generally the desirability of obtaining more exact information as to the home output of poultry and eggs.

(3) *Dairy Produce.*—Occupiers are asked to state the total production of whole milk on the farm, and also their sales of whole milk, cream, butter, cheese, and skim-milk, including sales to creameries and factories, during the preceding twelve months. The particulars thus obtained will be supplemented by special inquiries of creameries, butter and cheese factories as to their output during the same period, so as to enable estimates to be made of the total quantity of British dairy produce which comes into consumption.

(4) *Wool.*—The quantity of wool clipped from each flock in 1907 is to be given, the data thus obtained being utilised as supplementary to the special enquiries recently made by the Board, the results of which were published in the *Report on Wool Production.*

(5) *Labour*.—The information with regard to labour and motive power is desired for the purpose of obtaining some measure of the relative force employed in agricultural production as compared with that engaged in other industries. The labour employed on the farm will show the number of persons assisting the occupier, distinguishing between regular and temporary labour, numbers of the family and others, sex, and whether over or under 18 years of age. The form of the return, in this and other respects, has been carefully considered with the view of obtaining information from the largest possible number of occupiers, many of whom, it is recognised, do not keep accounts in sufficient detail to enable them to give fuller particulars. It is, however, proposed to make special enquiries as to temporary labour in certain districts.

(6) *Motive Power on the farm*.—This includes the number of steam or gas engines, or other mechanical motive power for driving machinery or implements, owned by the occupier. Hired machines are not to be included, and attempts will be made by other means to secure information with regard to them.

SMALL HOLDINGS IN HAMPSHIRE.

J. C. NEWSHAM, F.L.S.

Hampshire Farm School, Basing.

Few counties in England offer better opportunities to the small holder than Hampshire. In addition to being largely agricultural, the county is becoming more popular year by year as a health resort, particularly in the vicinity of Bournemouth and throughout the New Forest, while the north of the county, around Fleet and Farnborough, which has much in common with the south as regards pine woods, soil and general character, is also becoming a residential area.

The Labouring Classes.—The labourers met with throughout the county vary very considerably as regards intellect and ability to perform good work. As might be expected the most skilled labourer is usually found near the towns, where environment is responsible to a great extent for the higher development of his powers of observation.

The Naval depôt at Portsmouth in the south of the county, and the Military Quarters at Gosport, Winchester, and Aldershot are doubtless responsible for a general dearth throughout the county of young able-bodied men as workers on the land, the result being that on the majority of farms the labourers usually consist of young boys who have recently left school, and men many of whom are considerably over fifty or sixty years of age. In some cases, "service" men find their way back to the land, but by far the greater percentage make for the towns, not unfrequently returning to the country when they are no longer fitted for town life. It is in the purely market-gardening and fruit-growing districts of Hampshire that the best types of farm or garden labourer are to be met with; here the unskilled labourer (by which is meant the man whose sole knowledge of agriculture or horticulture is the correct handling of a spade or fork) can earn at least four shillings a day piece work, and never less than three shillings when engaged by the day; whereas, a man of like physique and age if engaged in similar work on an ordinary farm would not receive more than sixteen shillings per week, or in many cases fourteen shillings, apart from extra earnings and allowances.

Soils.—As regards variety of soils, possibly no county in England can compare with Hampshire. It often happens that within the area of one small farm, or even sometimes one particular field, many different soils may be found. In seasons of considerable rainfall, as in 1907, many of the lighter soils, and particularly those overlying chalk formations, are exceedingly productive, the crops being unusually healthy and free from disease. This state of things is the exception rather than the rule, and might be the means of deceiving those who are not familiar with the district.

Although much of the soil is poor, the tillage of Hampshire is, on the whole, good; and excellent fields of corn, roots, and fodder crops are grown. The richest soils in the county are those of the Upper Greensand, which yields a comparatively dry and friable loam, especially where it is the joint product of the Upper Greensand and the overlying chalk marl. The arable sheep farms of the upper chalk districts represent the lowest rented soils, these being only suited to grazing and the cultivation of arable crops for sheep food.

In many districts, the surface of the soil is characterised by the growth of furze, heather, and many species of worthless grasses. To bring these soils into a fit state of cultivation, thorough draining is required, or sub-soiling, accompanied by liberal manuring.

Markets.—The best markets, however, are by no means to be found near the most fertile land. Although the north of the county does not offer attractions in the way of soil, there are nevertheless good opportunities for disposing of all kinds of farm produce, more particularly poultry and eggs, for the production of which the soil is admirably suited. The principal markets in this district are to be found around Farnborough, Fleet and Aldershot, while the country around Headley and Grayshot in the east of the county and but a few miles distant from Hindhead in Surrey, has of late years become a fashionable residential district. In the strip running from Basingstoke through Micheldever to Winchester, and in the districts of Andover and Petersfield, there are to be found many large upland farms which are exclusively devoted to the breeding and rearing of sheep, generally Hampshire Downs, and very few mixed or dairy farms exist in these parts, except at lower elevations. This part of the country, therefore, presents but few attractions for the small holder, as regards soil or markets. It is in the Meon and Test valleys and among the water-meadows fed by the Itchen around Winchester and south towards Eastleigh, that dairy-farming flourishes.

The area, however, stretching from Romsey in the west, touching Chandler's Ford, Eastleigh, and Bishop's Waltham, to Hoildean in the east of the county, and southwards includes an excellent tract of country which should be open for development by the small holder, whose aim it is to make mixed farming a speciality. Numerous small mixed farms, ranging from 30 to 70 acres, already exist in many of these districts, notably around Bishop's Waltham, Romsey, and in the New Forest. These mixed holdings are usually well managed and prove a success, and what produce does not find a local demand is readily marketed in Southampton, Portsmouth, or Bournemouth. Fruit growing, however, is on a different footing. Of recent years this particular industry has assumed large proportions, and the markets which claim the attention

of the strawberry growers are London, and large provincial towns, including Glasgow, Liverpool, and Manchester. Around most of the larger towns in the south of the county, the farmer has entered the ranks of the market-gardener, not only as a grower of vegetables and fruit, but as a cultivator of flowers. It will behove the prospective small holder to give facts like these his careful consideration, particularly if his livelihood must depend on the production of vegetables by spade culture. These large growers are responsible in a great measure for periodic gluts on the market of one or more vegetables, which, if too often repeated throughout the season, must severely cripple, if not completely ruin the small man.

I have repeatedly seen runner-beans offered in Portsmouth Market for less than 6d. per bushel in the height of the season ; peas, 1s. per bushel ; marrows, 3d. per dozen ; while on many occasions broccoli and cauliflowers have been sold at equally unremunerative prices.

The increase in the number of allotments throughout the county, together with existing private gardens, may also be held responsible for flooding many small towns with vegetables in the height of the season ; for this and many other reasons the cultivation of vegetables as a sole means of livelihood must be undertaken with caution.

It is not to be expected that Hampshire will compare with the Midland Counties of England as regards its railway facilities, but for a county south of London it is well served, chiefly by the London and South Western Railway. Apart from its more important enterprises in connection with shipping at Southampton, this Company has within the past few years opened several light railways, the chief of which is that running from Fareham to Alton along the Meon valley, a district possessed of much fertile soil, in which small holdings of the mixed farm type might with advantage become established.

The district between Alton and Basingstoke, although possessing similar facilities, does not present the same inducements to the small holder, principally owing to the heavy retentive nature of much of the soil, which might be classed as woodland ground. As the district is thinly populated there is practically no local market, and the cost of placing small

quantities of milk or other produce on rail would be considerable. In the Romsey district there is a through line from Southampton, *via* Eastleigh, to Salisbury in Wilts. From Southampton to Andover the railway line runs along the valley of the Test, where are to be found many small farms entirely devoted to the production of milk and dairy produce. From Andover Junction the main Salisbury to London line proceeds through the villages of Whitchurch, Overton, and Oakley to Basingstoke.

Types of Holdings.—We may next consider the different types of holdings in the county, beginning with those which have proved to be profitable. These are very varied in character, and it is needless to remark that the success of any small holding depends to a great extent on the capabilities and intelligence of the occupier.

Strawberry Growing.—Fruit growing, particularly strawberry culture, is an industry which has developed considerably in recent years. The districts suitable to the cultivation of fruit in Hampshire are undoubtedly limited, as so much depends on the aspect and natural adaptability of the soil. The land around Botley, Swanwick, Sarisbury, and on either side of the Hamble river is peculiarly favourable to the early ripening of the fruit, and there are still earlier soils from which much of the first gathering can be placed on the market from a week to ten days before the fruit produced by rival growers in Kent. The majority of small growers in these districts are self-made men, many having commenced as labourers at 18s. to £1 per week. As the question of profitable strawberry cultivation is dependent on so many circumstances, it would be misleading to quote in detail from any individual balance sheet, but a few facts relative to expenditure and receipts will be useful by way of illustration. The cost of freehold land in the Botley district varies from £80 to £120 per acre, while around Sarisbury and Swanwick very little good land can be bought for less than £100 to £150, and considerably higher prices are paid for land known to produce especially early crops.

All classes of houses are scarce in these districts, and in most cases are the property of growers. Around Botley a few six-roomed houses are let at £12 per annum, exclusive of rates, but in the districts above mentioned a house of like accommodation

cannot be obtained for less than from six to seven shillings per week. To afford a comfortable living for man and wife, not less than ten acres of mixed market garden are usually required, according to position and quality of soil, but when planted exclusively with strawberries, from four to five acres will provide a living for a man with a small family. Several men who commenced business with a capital of between £100 and £200 have been able to make an average income of £2 per week.

The cost of breaking up new land varies very considerably. In the case of land covered with "scrub" it may cost as much as £20 per acre, whereas ordinary arable farm land, if not too badly infested with weeds, need not exceed more than £3 per acre for cleaning and preparation for planting. Ploughing from 12 to 16 inches deep costs £1 to £1 5s. od. per acre. Trenching new ground two feet deep costs from 2s. 6d. to 3s. per rod, whereas ground previously worked will cost from 1s. to 2s. per rod. Manure to the value of from £6 to £12 per acre is usual; many growers allowing as many as 30 loads of farm-yard dung per acre. The average price of this manure is 5s. to 7s. per load, while the cost of spreading is from 2s. 6d. to 3s. per acre.

The number of strawberry plants required to stock one acre of ground varies from 12,500 to 16,000; these cost from £4 to £8, according to season, and whether they are layered plants, or runners, which receive no special preparation. Planting means an outlay of from £2 to £3 per acre, and the cost of keeping the ground clear of weeds, from the time when the plants are planted say in October, 1907, until the first crop is gathered in June, 1909, would be approximately £9.

Hoeing by hand is reckoned at about 15s. per acre, and horse harrowing or hoeing at 2s. 6d. Straw for bedding will cost from £3 to £4 per acre.

The most expensive of all operations connected with strawberry cultivation is the gathering of the fruit, which will cost from $\frac{1}{2}d.$ to $\frac{1}{2}d.$ per lb. if carefully performed. There is also the cost of baskets, and other incidental expenses.

As regards returns for the above-mentioned expenditure, the average crop per acre for the past five years can be estimated at 1,000 baskets, realising a profit of 1s. per basket to the grower. The yield of 1906 would fall somewhat below this

number, but that of 1907 would be proportionately high, many acres yielding over 2,000 baskets each.

The cost of railway carriage, commissions, postage, and incidental expenses are approximately: London, $3\frac{1}{2}d.$ per basket; Manchester, $4\frac{1}{2}d.$ per basket; Birmingham, $4d.$ per basket; Glasgow, $6\frac{1}{2}d.$ per basket; Edinburgh, $7\frac{1}{2}d.$ per basket.

The actual railway rate to the above mentioned towns at the Company's risk would be respectively 1s. 11d., 4s. 10d., 3s. 4d. 8s. 0½d., 8s. od. per cwt. Fruit despatched further north to Aberdeen would cost as much as 9s. 5d. per cwt. at the Company's risk, or 7s. at owner's risk.

Small Mixed Holdings.—There are in the county many small mixed farms, generally in close proximity to the large and moderate sized towns. The produce from these holdings consists of milk, butter, soft or French cheese, poultry, eggs, honey, fruit, vegetables and salads, all of which usually find a ready local sale at remunerative prices. I have known but few failures in this particular class of holding, when the cultivator has had a practical knowledge of his work, is industrious, and thrifty.

The rent paid for these holdings varies from £1 to £2 per acre, according to soil and locality, although occasionally fancy prices have been demanded for accommodation land.

The amount of capital required to start a holding of this type may be roughly estimated at about £10 per acre, up to 50 acres. Many start with considerably less, but in such cases the live stock is usually inferior in quality, the land is not farmed as well as it ought to be, implements have to be borrowed, and in consequence the holder is handicapped for at least four or five years, however hard he may work.

Many of these small holders are Army and Navy pensioners, who are not entirely dependent on their holdings for a livelihood.

Watercress Growing.—In the villages of Old Basing, Mapledurwell, and Overton, each of which is situated a few miles from Basingstoke, the cultivation of watercress for the London market is an old established business. Although not so prosperous as in former years, it still affords a means of livelihood for a number of small holders, though as a rule the cultivation is on a large scale. When engaged

by the larger growers a man's rate of pay is usually from 3s. to 4s. per day. Women generally do the bunching, and are paid $\frac{1}{4}d.$ per dozen or 2s. $1\frac{1}{2}d.$ per hundred dozen, and in the busy season will often earn between 4s. and 5s. per day.

Early supplies from February to March will average 6d. per dozen bunches; from then on to the first week in June, when the supplies from these districts cease, the average may be taken at 4d. Several growers with whom I am acquainted give their average for the season at between 25s. and 30s. per 100 dozen bunches after deducting carriage, salesmen's commission, and sundry incidental expenses.

Some years ago large profits were derived from watercress by cultivators in these districts; but of late years other competitors have entered the arena, and the demand has not increased. Even now, however, a profit of £50 may be made from 1 acre of watercress beds where the water is supplied from natural springs. The still waters are not used so much for cultivation as in past years, and many have been condemned. It is worth remembering that in addition to the actual work during the height of the season, an acre of watercress beds will provide quite sufficient employment for a man throughout the dull season of the year in repairing and making the beds.

Market Gardening.—I have been informed by several market growers in the vicinity of the larger towns, that if they had no flowers they would experience some difficulty in making their holdings pay. It is rarely that one meets with market gardens in the county where the ground is rented exclusively for the cultivation of flowers, although in the neighbourhood of Portchester, which is some six miles from Portsmouth, a large acreage is devoted to flowers, particularly violets.

Much of the soil in this locality, especially that on the southern slopes of the Portsmouth Down hills, and close to the sea, is extremely fertile. The average rent here is £4 per acre, but in a few exceptional cases as much as £10 per acre is paid. The price of land when obtainable is, on an average, about £150 per acre. One man I happened to meet informed me that he was able to support his wife and self on $2\frac{1}{4}$ acres of ground, which he rented at £10 per acre; not having sufficient means to keep a horse and cart, his produce

was marketed along with that of larger growers, and he usually had a fair share of the trade.

The cost of labour is much the same as in other market gardening districts, labourers being paid 18s. per week and 4d. per hour overtime. Six-roomed houses range from 7s. to 8s. per week, labourers' cottages from 4s. to 5s., exclusive of rates, which are 2s. 10d. in the pound, but suitable houses are very scarce.

In many out of the way districts, I have often come across men who have specialised in the production and cultivation of some particular flower, although in many cases it would be only proper to class these holders as small nurserymen. Within a few miles from Winchfield, I know one man who makes quite a comfortable living by the cultivation of violets and carnations.

Unsuitable Holdings.—The greatest failures among the small holders of Hampshire are to be found among those who have possessed limited capital and a still more limited knowledge of agriculture, with little or no idea of how to manage the holding, which they may have striven for many years of their life to acquire. My observations are not based on a few isolated cases of failure, but on a large number and over a long period of years. In the majority of cases the land possessed by these holders has been quite unsuited for the purposes to which they had applied it. The soil has generally been a heavy clay or gravelly soil, and the freehold has often been taken up at £20 to £25 per acre, which price includes fencing. As there was no house accommodation a building of the bungalow type was usually erected at a cost of from £120 to £150, while the acreage of land comprised in these holdings varied from 1 to 10 acres.

Near Medstead, Ropley, Overton, and some other districts where the majority of these holdings are situated, no associations for the fostering of co-operative ideas are in existence, and each holder has to act entirely on his own initiative and responsibility; so that with unsuitable soil, small floating capital, and poor markets the difficulties in the way of success have been insuperable. The few men who are in any way successful usually seek other employment than that afforded by their own portion of land, and are found ploughing,

and otherwise assisting large farmers, or acting as carters for still smaller holders. One particular man, who commenced with a capital of £300, and bought ten acres of land at £25 per acre, built himself a bungalow costing roughly £150, and now, after three years' hard work, has met all his current liabilities and is independent except that £100 is still owing. This he does not consider as much of a stumbling-block, and is quite hopeful of freeing himself entirely in the course of another year or so. This man is an expert ploughman, and undoubtedly this has proved of great advantage to him, for without some such employment he might have succumbed under the many disadvantages he has had to put up with.

I know of no single instance in the county where a man and his family make a living from poultry or bee-keeping alone, although there are numerous instances where one or both of these add very considerably to the weekly returns when considered as supplementary. I have seen many attempts made throughout the county to run both large and small establishments confined to the breeding and rearing of poultry, but in each case the enterprise has had to be abandoned, even when in the hands of men who thoroughly understood their business. One man informed me that his great difficulty was to obtain birds for fattening, and having to purchase these from Ireland, he could not possibly make fattening pay, although in this particular case he had a cold storage plant at his disposal. Another equally expert man in bee-keeping, who devoted the whole of his time to bee-work, including the sale of appliances, was latterly obliged to extend his business in other directions than that of bee-keeping, or "go to the wall."

As typical of the class of small holdings which are a partial success, we cannot do better than take the district of Tadley, which is some seven or eight miles from the town of Basingstoke. The nearest station is Bramley, some five miles distant, on the Great Western Line. Here every resident, with few exceptions, is a small holder, the majority, known locally as "Tadley men," being expert at hoeing, and all operations connected with harvesting. As hop-pickers, they leave their homes in the autumn for the hop-fields; in the spring of the year they engage themselves to do piece work on the larger

farms in the district. The prices paid by farmers vary considerably, being influenced by the conditions of soil, freeness from weeds, yield of produce, &c., but the following prices may be taken as representing a fair average: Flat hoeing, 6s. to 7s. per acre; singling mangels, 7s. to 8s. per acre; singling swedes, 5s. to 6s. per acre; hand cutting (fagging) wheat, 10s. to 15s. per acre, or a heavy crop badly laid may cost £1 per acre; shocking, from 1s. to 2s. per acre; mowing grass, 7s. to 9s. per acre; mangel pulling, 8s. per acre.

Others not engaged in these operations find employment in hay-tying, thatching and hurdle making, while birch-broom making has developed into quite a flourishing industry in this locality, Tadley brooms finding their way to all parts of the country. Locally these brooms are retailed by the makers at 2s. 6d. to 3s. per dozen.

Here as in many other places throughout the county the houses and land are the freehold property of the occupiers, having been acquired through the assistance of a local Friendly Society or some other Institution. The soil around Tadley is variable in character, and is mostly heavy clay, although in some places 18 inches to two feet of good loamy soil is to be found. Other parts again are very gravelly and sandy, so that the rent of land varies from 15s. to 30s. per acre.

A few years ago land could be purchased for £20 per acre, but of recent years prices have advanced considerably. Three-roomed cottages can be rented at from £4 to £5 per annum. Six-roomed houses with gardens of $\frac{1}{2}$ to $\frac{1}{4}$ acre are to be rented at from £10 to £12. Although a large assortment of fruit trees are to be seen in the gardens, they are mostly neglected, cow and pig keeping being the usual source of profit.

In conclusion it may be said that in most parts of the county there appears to be ample opportunity for the development of mixed holdings by men who have been brought up on the land and know the practical side of their business. The town-bred man must of necessity have an uphill struggle, though his business capacity or training might stand him in good stead.

Above all things it must be emphasized that the success or failure of additional small holdings in this county will depend to a great extent on the system of co-operation adopted. If an enlightened co-operative movement could be

fostered and made a success, there is no doubt that many districts, where produce cannot under present conditions be satisfactorily marketed, would become flourishing and prosperous, to the advantage not only of the occupier and the county, but also of the nation as a whole.

THE MARKETING OF POULTRY.*

In continuation of the information as to the prices and supplies of poultry at the principal provincial markets in Great Britain, which was published earlier in the year, the Board think that the following notes, which have been furnished by their Inspectors and Market Reporters, will be of service.

Liverpool.—The supplies may be classed under the following heads :—Home-reared, Irish, Russian, American, Canadian, Hungarian, Servian, Italian and French.

Home-reared Poultry.—The home-reared supply is very limited, and includes those reared on farms in the neighbourhood, and those artificially fed or crammed, but bought alive in Ireland. The former are unimportant, and have little bearing on the trade taken as a whole. The latter are worthy of note from the fact that the largest cramming establishment in the neighbourhood, and perhaps in England, sends a large proportion of its chickens to Paris, and the remainder are sold to the large passenger steamship companies. There is no local demand for crammed birds, as retailers cannot afford to pay the high prices, the average retail price being 10d. per lb., whereas the steamship companies pay 11d. per lb. for birds from 5 to 7 lb., and 1s. per lb. is obtainable in Paris.

Irish Poultry.—Irish poultry generally form the chief source of supply. Chickens arrive both alive and dead, those alive going to the cramming establishments, but by far the greater number come plucked and drawn and packed in boxes, the supply being plentiful from June to January. The quality of the chickens is said to be falling off from the fact that Irish breeders go in largely for the production of eggs, and the best egg-producing varieties are not suitable for table purposes. On the other hand the ducks and turkeys, especially the latter,

* See "The Marketing of Poultry," *Journal*, Vol. XIV, No. 11, February, 1908, p. 641.

have improved in late years, as there is not much demand for eggs, and it is probable that some of the finest turkeys on the market come from Ireland. Geese come in large quantities, but they are bred and reared to a great extent for the live trade, and are sold for feeding on the English stubbles ; they are of good quality, but not large. The chief point where Irish poultry fall behind the foreign supply is in the grading and packing. The average weight for Irish poultry would be : Chickens, $2\frac{1}{2}$ lb. ; ducks, 4 lb. ; geese, 9 lb. ; and turkeys—hens, 10 lb. ; and cocks up to 20 lb.

Russian Poultry.—Chickens come chiefly from February to June, although they arrive in smaller consignments all the year round. The chickens are all graded and packed in boxes, the birds in each box being of uniform weight ; this is a great convenience both to the wholesale man and the retailer. The tendency now is to a lower grade of chicken, owing to the same cause as prevails in Ireland, namely, breeding for egg production. Ducks are not sent in such large quantities as chickens or geese, but they are graded and of fine quality.

Geese form an important branch of the trade, and great attention is paid to the feeding, killing and packing ; they are packed about twelve in a box and are of uniform weight ; each bird is wrapped in paper, and they arrive looking as fresh as when killed. Turkeys are comparatively unimportant, and are of rather inferior quality.

The peculiarity about the Russian trade is that all poultry are killed at the same time, namely, about the second week in November ; they are frozen and kept till wanted, and sent over in cold storage as ordered.

Canadian and American Poultry.—Chickens arrive chiefly in the early months of the year, and a large number of the frozen beef firms also handle chickens ; they are packed and graded, and are generally of good quality ; when retailed they are hardly distinguishable from the Russians. Cramming is carried on in America and Canada to a large extent, but these birds are mostly for home consumption. Interesting experiments have been made as to the cold storage of chickens, and it has been found, from careful experiments, that birds keep their weight and firmness of flesh if frozen undrawn. The weights are about $2\frac{1}{2}$ lb., being much the same as the

Russian, and his weight is considered most suitable for hotel trade.

Ducks, geese and turkeys are not a very large trade. Hungarian, Austrian, Italian and French chickens and turkeys are an important trade at Christmas, but during the remainder of the year they are sold chiefly in Paris and towns on the Rhine. They are quick grown and of fine quality, especially the French turkeys, which are fed especially for the London Christmas trade.

Taking Liverpool as a distributing centre, it is the largest for Russian, Canadian and American poultry ; but Hungarian, Austrian, Italian and French are consigned chiefly to London.

Manchester.*—There are practically no English geese sent to this market, the entire supply from Michaelmas to Christmas coming from Ireland, while at Christmas and onwards to the end of January Russian geese are chiefly used. The Irish geese are small but of good quality, and very suitable for the Manchester Michaelmas trade, the Russian are larger and well fed, and are more suitable for the Christmas trade. A few geese come from France, but these are soft in flesh and not very popular.

The trade in turkeys varies with the seasons—from the end of September to Christmas the demand is chiefly for small turkey-poults of from 6 to 8 lb. each, these are all supplied from Ireland and are of exceptionally good quality. At Christmas and to the end of the season the demand is for larger birds ; the majority of these are also from Ireland, but a large number of the heaviest birds come from France and Italy ; these are of good appearance, but the proportion of bone to the amount of flesh is large. There are practically no Norfolk turkeys used.

Taking the poultry trade as a whole it is much the same as Liverpool. The retail trade is controlled by a combination of firms trading in different parts of the town ; the wholesale trade is carried on chiefly in the public fish market and in the general market. The chief ports of landing are Holyhead for Irish, Hull for Russian, and Liverpool for American and Canadian.

* A note on the Manchester poultry market was given in the *Journal*, February, 1908, p. 645.

Leicester.—*Chickens.*—The local demand in the spring is very limited, the chief consumers being hotels and restaurants, and supplies to fill the demand are obtained from large wholesale dealers in London and Liverpool, the only local supply being birds kept over from late hatches in the previous year. The supplies from the wholesale dealers are from cold storage, and include Canadian, Russian, French, and Irish; the average weight of these is about 3 to 3½ lb.; they are shaped by the breast bone being broken down, the head taken off, the wings removed at pinion joint, and the legs removed at third joint from body. Locally bought birds are roughly plucked, with head and neck, legs and feet left on, and before being retailed are shaped as above. The demand is pretty uniform during the close season for game.

Ducks.—Very little demand, and supplies mostly local; they are bought from farmers both in feather and dressed.

Geese.—There is a small demand at Michaelmas for grass, or what are termed "green," geese, and supplies are obtained locally; fatted geese are in good demand at Christmas, but Leicester being a manufacturing centre, the medium class and Irish geese are in most demand.

Turkeys.—The demand is chiefly at Christmas and up to the end of January. The manufacturing class want a turkey of about 10 to 14 lb., and this demand is supplied by French birds at about 9d. to 10d. per lb., and what are known as turkey poult, that is, young turkey hens and year-old turkey hens; these are usually sold dressed. The better class trade is done in English (chiefly Norfolk) large turkeys of from 18 to 26 lb., which then fetch, from 1s. to 1s. 2d. per lb.; these are bought in feather and exhibited with breast plucked and also dressed.

Glasgow.—*Chickens.*—There is practically no local supply, and poulters complain of the lack of enterprise on the part of the Scotch farmers as regards poultry rearing. The supplies are almost entirely from Ireland; these arrive in boxes. They are small in size, but well fed and of good quality; they are plucked and drawn, the head and neck left unplucked; before being retailed they are shaped by being slightly warmed and put in a wooden shape, the breast bone being broken down; for roasting, the feet only are removed; for boiling, they are removed at the joint above the foot, the wings

are bent under the back and the legs doubled up and held in place by the wings. During the early spring, when there is a shortage from Ireland, Russian, Canadian and American frozen chickens are used, also French ; these are obtained from wholesale dealers at the various ports of landing ; Canadian and American from Liverpool, Russian from Hull, Grimsby and Leith, and French chiefly from London.

Ducks.—The supply is almost entirely from Ireland ; there is not a large demand for ducks, and the prime ducks from England are not much asked for. Russia sends a considerable number, but there is not much demand for them.

Geese.—There is very little demand for geese ; at Michaelmas, a few Irish geese fed locally are sold, but the chief supplies are Irish killed.

Turkeys.—Supplies are almost entirely from Ireland ; in the early part of the season the demand is for turkey pourets at about 4s. to 4s. 6d. each : these are all Irish. Later in the season and towards Christmas, larger birds are wanted, and birds up to 20 lb. each are obtained from Ireland ; but the best quality birds are French, and can be got any weight ; the only drawback to them is that they have the breast broken down.

Taking the Glasgow poultry supply as a whole, it might be called almost entirely Irish.

Brighton.—A good local supply for nine months up to the end of February, then for about three months Canadian poultry (chilled) is purchased.

Chichester.—There is a good local supply all the year round from this neighbourhood.

Plymouth.—The supply comes from Devon and Cornwall chiefly ; very few Irish or foreign.

Bristol.—Supplies are received from farms round, but the bulk comes from Ireland. There is very little foreign trade.

Newport (Mon.).—Nearly all local.

Hereford.—There is a good local supply.

Birmingham.—Chickens and ducks are received from Shropshire and adjoining counties, Wales, and Ireland ; turkeys and geese from Ireland, from September to Christmas. Foreign chickens come from Austria, America and Russia ; turkeys from France, at Christmas time, and from Italy, Servia and Austria ; geese from France at Christmas ; from Russia from November to February ; and a few from Servia.

Shrewsbury.—The supply is entirely from the local farms, and what is not sold for local consumption is bought by the Birmingham and Wolverhampton dealers.

Chester.—The local supply comes from North Wales and Shropshire. Oswestry is the best market. American chickens are received from March to July. No sale for Russian poultry.

Carlisle.—Supplies are entirely local, being bought alive by dealers from farmers in the district and adjoining counties ; they are fattened by ordinary means by the dealers, killed and trussed. There is no foreign supply.

Aberdeen.—American chickens are imported in quantity in spring, *via* Hull, Liverpool and Glasgow ; they are well fed, but the colour is not appreciated as it is too yellow.

Dundee.—Local supplies are equal to demand, except during first three months of the year, when supplies come from Ireland. Small quantities of American chickens are sold.

Edinburgh.—The supplies are mostly Irish for all kinds of poultry and the trade is very similar to that of Glasgow, one difference being that some Edinburgh poulters also get live chickens from Ireland and fatten them, but this is not done on a large scale. In all other respects the remarks on Glasgow apply equally to Edinburgh.

Newcastle-on-Tyne.—This is not a distributing market ; supplies are drawn from neighbouring counties and are sold mostly for local consumption. There is a fair amount of trade done in chickens, game and turkeys from France and Russia.

Darlington.—The supply is chiefly home-bred, dealers buying from farmers in the neighbourhood and at near local markets. A large number of Irish geese are sold at this market in the autumn, and are bought by farmers and brought back into the market fat ; there is very little foreign trade.

York.—The trade here is local. This is a collecting market, dealers attending and buying for Leeds and other large centres ; there is very little foreign trade.

Leeds.—Leeds is a large distributing market, sending poultry to all surrounding markets ; supplies of chickens and ducks are collected from Thirsk, Northallerton, York, Ripon, Knaresborough and Wetherby. Geese and turkeys come from above districts, also from Lincolnshire and Ireland. There is also a considerable trade in poultry from France and Russia.

Bradford.—Supplies are chiefly bought in Leeds, and the trade is much on the same lines.

Wakefield.—There is very little local supply, but a considerable number of chickens are bought at Thirsk, Selby and Ripon and are brought to Wakefield alive, and killed and dressed by the poulters. There is not much demand for geese and ducks, and these are bought chiefly in Leeds Market. Turkeys come from Yorkshire, a few from Norfolk, a large number from Ireland, and a few from Italy and France ; these are bought chiefly in Leeds and Liverpool and not sent direct.

Hull.—Supplies are drawn from the neighbourhood, and from local markets ; there is also a large trade done in chickens, geese and turkeys from France and Russia.

Lincoln.—From October to end of January, there are plentiful local supplies of chickens ; from February, the supplies are chiefly foreign, Russian, Austrian, French and Canadian chickens being obtained from Liverpool. The ducks, geese and turkeys are chiefly bought locally.

Derby.—Supplies are drawn chiefly from the neighbourhood and sold for local consumption. There is a fair amount of trade done in Russian chickens during the months of March, April and May.

Peterborough.—There is very little trade done in poultry for local consumption, the chief business being the collection of poultry for fattening and killing for the London market ; all kinds of poultry are dealt in. The poultry during hot weather are sent untrussed, but in cool weather are trussed.

Norwich.—There is a plentiful supply of poultry raised in the neighbourhood ; a large amount, especially ducklings and turkeys, is sent to markets all over England. There is very little demand for foreign poultry, local supplies being sufficient for the trade.

Ipswich.—Supplies are almost entirely local and are brought in by farmers. There is practically no foreign trade.

EXPERIMENTS IN THE HOUSING AND FEEDING OF POULTRY.

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Within recent years many changes have taken place in the methods of housing and feeding poultry. In America what has been known as the Colony System has been largely adopted, especially in Rhode Island and New Jersey. By this method a much larger number of birds can be kept on a given area of land than has been regarded as desirable in Britain, in some cases as many as 200 per acre. The fowls are placed out on one or more fields, accommodated in houses, each of which holds 30 to 50 hens. As a rule no fences are used and all the birds run together, but where it is necessary to keep them from adjoining fields a fence of wire netting is placed around the entire area given up to them. The ground thus allocated to the fowls is occupied entirely for one or two years, as may be deemed desirable, at the end of which time houses and inmates are removed to another part of the farm, and the vacated ground is not occupied again by poultry for three or four years, as it is considered that the manure produced by the birds will exert its influence upon the crops grown for that period. From the experiments previously recorded in the *Journal of the Board of Agriculture*, Vol. XIII, p. 719 (March, 1907), it would appear that, at the rate of 100 birds per acre, four tons of moist manure would enter into the soil during twelve months on that area. Descriptions of this system are given in Mr. Edward Brown's *Report on the Poultry Industry in America*,* and in the paper by Mr. J. H. Robinson, read at the Second National Poultry Conference, 1907.†

In America within recent years a new method of feeding has received a large amount of attention. This is known as the Hopper System. The food is placed in wooden hoppers, holding a quarter or half a hundredweight, or a supply for about a fortnight according to the number of birds. The hopper has a tray into which the food auto-

* London : National Poultry Organisation Society, 1906.

† London : *Official Report of the Second National Poultry Conference*, 1907.

matically falls as that already in the tray is consumed, and the birds can eat whenever they feel inclined. Such a system saves considerably in the labour of feeding. But a further point is that meal only is given in this way. Hitherto the majority of poultry keepers have believed that to keep food constantly before the birds would be wasteful in the extreme, and that the true method is to give just as much food as will be eaten readily twice a day. Further, that whilst grain is given in dry condition, meal must always be prepared by mixing with water into a dry, crumbling mass. Hence "dry mash" feeding is against all the canons hitherto accepted.

With a view to testing these methods, a series of experiments have been conducted at the College Poultry Farm, Theale, in connection with University College, Reading, during the last twelve months, of which complete records are now given.

COLONY SYSTEM OF HOUSING.

Location.—For the purpose of this experiment a section of one field in permanent pasture has been allocated. It consists of 3,154 square yards, or rather less than two-thirds of an acre. It is good land with a capital belt of trees and hedgerow on the south and east sides, where is a running stream, so that the grass very seldom dries up, even in a hot summer. The shape is uneven, almost triangular. A fence of 6 ft. wire netting encloses it completely, and the birds are not allowed out on the adjoining fields. The grass kept abundant during the entire year, so that there was always a plentiful supply of green food, but, it may be noted, the summer of 1907 was cool and moist, and there was no check to the growth of herbage. Within the enclosure are two ordinary open-fronted poultry houses, but without scratching sheds. There are no divisions of the ground, over which all the birds can roam as they think fit.

Birds used.—Fifty Buff Orpingtons were selected for this experiment, namely, forty-eight pullets and two cockerels, all of which were hatched in the month of May, 1906, from purchased eggs. As records were kept from January 16th, 1907, they were at that time about eight months old. Probably a much better result would have been obtained had earlier hatched pullets been chosen, and from selected stock,

but these were not available, and the experiment was intended to determine cost rather than egg production. As none of the birds had commenced to lay, and the experiment was intended to be continued over a complete year, this was not so important as might at first sight appear. It is suggestive to note that although only two cocks have run with the pullets, that is, twenty-four females to one male, the fertility has been remarkably good. The system, however, is used more for laying than breeding stock, and, as it is undesirable to use yearlings as breeders except for the production of chickens to be killed at an early age, it was not intended that the test should in any sense depend upon fertility of eggs. The birds have kept remarkably healthy, and there have been no deaths during the twelve months.

Feeding.—The method of feeding adopted was a combination of "dry mash," with the addition of grain (wheat and barley), roots (mangolds) and green bone. In the second quarter (April to July) the grain, roots and green bone were omitted owing to the abundance of grass and other natural food, and were not given again until early in January, so that for practically nine months out of the twelve the supplied food was entirely "dry mash," as will be seen by the tables below. The mash consisted of a mixture prepared as follows:

	Parts by Weight.		Parts by Weight.
Bran	2		2
Toppings...	1		3
Linseed Meal	0½		3
Indian Meal	2	or	Linseed Meal ... 0½
Beef Scraps	1		Clover Meal ... 1
Clover Meal	1		
Ground Oats	1		

The various ingredients were thoroughly mixed and had an albuminoid ratio of 1 : 3·4. During the first half of the year the cost was 8s. 9d. per cwt., but owing to advance in price of some of the meals the average cost afterwards was 9s. per cwt. The grain supplied consisted of equal parts of wheat and barley (except in January, 1908) having an albuminoid ratio of 1 : 6·6, costing 7s. per cwt.; the mangolds had an albuminoid ratio of 1 : 8·48, and cost 9d. per cwt.; green bone cost 2d. per lb. As it was found that the food cost was very high during the first two quarters, owing to the large amount of waste, boxes were fitted below the hopper trays to catch whatever was drawn

out by the birds, effecting a very large saving, and reducing the cost considerably.

TABLE I.—Amount of Food Consumed, and Cost.

Nature of Food.	First Quarter.		Second Quarter.		Third Quarter.	
	Weight.	Cost.	Weight.	Cost.	Weight.	Cost.
Dry mash	lb. 1,075	s. d. 83 9	lb. 1,211	s. d. 94 8	lb. 889	s. d. 71 6
Grain	208	13 0	—	—	—	—
Mangolds	484	3 3	—	—	—	—
Green bone	60	10 0	—	—	—	—
Total	1,827	110 0	1,211	94 8	889	71 6
Average per bird ...	36·54	2 2·4	24·22	1 10·72	17·78	1 5·16
Average cost per bird per week	—	0 2·03	—	0 1·75	—	0 1·32
Total food consumed	16 cwt. 1 qr. 7 lb.	10 cwt. 3 qr. 7 lb.	7 cwt. 3 qr. 21 lb.			
Nature of Food.	Fourth Quarter.		Total for Year.			
	Weight.	Cost.	Weight.	Cost.		
Dry mash	lb. 821	s. d. 66 0	lb. 3,996	s. d. 315 11		
Grain	7	0 0 5	215	13 5		
Mangolds	—	—	484	3 3		
Green bone	5	0 10	65	10 10		
Total	833	67 3	4,760	343 5		
Average per bird	16·66	1 4·14	95·2	6 10·42		
Average cost per bird per week	—	0 1·24	—	—		
Total food consumed	7 cwt. 1 qr. 21 lb.		2 tons 2 cwt. 2 qrs.			

The cost recorded in this table is much higher than would be profitable to the poultry-keeper, as at the average rate of 1d. per egg, $82\frac{1}{2}$ eggs in the year would be required to pay the food bill for every bird, or reckoning the two males, each hen would need to produce nearly 86 eggs to meet the charge for food alone. For reasons already given it would be unfair to regard this as the actual cost. Taking the last quarter, during the whole of which the boxes to hoppers were used, and making that the

basis, the total cost for the 50 birds would be 269s. (£13 9s.), equal to an average of 5s. 4·56d., and leaving out the males, each hen would require to produce rather more than 67 eggs per annum to meet the food charges, which is not an excessive number. Whether this estimate is justified remains for further observation.

Egg Production.—Below are the records of egg production given in months, but it is necessary to mention that all the hens became broody at one time or another, and that from September to December they were moulting.

TABLE II.—Egg Production.

Month.		Total Number of Eggs.	Average per Hen.
January, 1907 (16 days)	...	19	0·4
February ,	...	386	8·04
March ,	...	602	12·54
April ,	...	661	13·77
May ,	...	646	13·46
June ,	...	429	8·94
July ,	...	332	6·92
August ,	...	173	3·6
September ,	...	24	0·5
October ,	...	15	0·31
November ,	...	5	0·10
December ,	...	32	0·67
January, 1908 (15 days)	...	58	1·21
Totals	...	3,382	70·46

As will be seen, the average for the flock was distinctly low, leaving a very small margin of profit, which shows the importance of selection to secure a larger yield of eggs. The food cost was actually 1s. 2·61d. per dozen eggs, or on the estimated basis given above, the food cost would be 11·44d. per dozen eggs, which is much above the profitable basis. As, however, the system of feeding does not conduce to large egg production, in that respect the result is unsatisfactory. That does not, however, affect the Colony Method of Housing, and it will be necessary to test it in combination with ordinary methods of feeding before any definite judgment can be arrived at. How far restriction within confined areas continued over an entire year reduces egg production is by no means solved, and remains for further investigation.

HOPPER v. ORDINARY FEEDING.

In this case more definite conclusions can be stated, as comparisons were made between two breeds kept under identical conditions, fed in different ways. Further, as the eggs were kept for hatching, records are available in respect to fertility. The experiment was designed to compare the results obtained by feeding (1) on the dry mash hopper system, and (2) in the ordinary manner, in order to determine as far as possible (*a*) the comparative cost of the two systems, (*b*) the egg production, and (*c*) the fertility of the eggs so produced. The experiment commenced on December 1st, 1906.

Location.—Four of the open-fronted scratching shed houses were devoted to this experiment, in each of which one lot of fowls was kept. These houses are 10 ft. square, 8 ft. 6 ins. high in front, sloping to 6 ft. 6 ins. at the back. They are well built, and have netted fronts so that the birds have nothing between their roosting place, at the back, and the open air. The front portion of each shed is laid down in gravel, upon which cut chaff and straw are littered, and in this the grain fed is thrown to induce exercise by scratching. In front of the sheds, which face south, are open gravel yards. Large grass runs are given on the west, each of which averages 345 square yards, and during the summer months luxuriant belts of artichokes gave excellent shelter from sunshine, and afforded a natural scratching ground.

Birds used.—Four lots of yearling birds were selected, each lot consisting of 1 male and 8 females, namely, 2 lots of White Wyandottes and 2 lots of Buff Orpingtons. Table III gives the particulars.

TABLE III.—Breeds.

Lot.	Breed.	When Hatched.	How Fed.
I.	White Wyandotte	... April, 1906 ...	Dry mash.
II.	Buff Orpington	... Late March, 1906 ...	Dry mash.
III.	White Wyandotte	... April, 1906 ...	Soft food and grain.
IV.	Buff Orpington	... Late March, 1906 ...	Soft food and grain.

On December 1st, 1906, when the test commenced, the pullets were in ordinary condition, but had not attained

their full growth. None had laid prior to the time they were put in the pens.

Feeding.—Lots I and II were fed in the same manner as described in Experiment No. I, namely, with dry mash fed in hoppers, and during the first quarter, with wheat and barley in litter, after which these were discontinued. Green bone was also given during the first four months. Lots III and IV were fed in the mornings with soft food prepared in the usual manner with hot water, and consisting of either of the following mixtures :—

A.				B.			
Toppings ...	2 parts.			or			
Barley meal ...	1 part.			{			
Bran ...	1 "			{			
Meat ...	$\frac{1}{2}$ "			{			

These mixtures have an albuminoid ratio of 1 : 4·5, and cost during the earlier part of the period, 7s. 2d. per cwt., and later, 7s. 6d. per cwt. At mid-day green food and cut bone were given so long as they were used, and in the evening the wheat and barley were scattered in the litter. The quantities and cost of food consumed by each lot are shown in Table IV.

TABLE IV.—Quantities and Cost of Food Consumed during the Year.

Nature of Food.	Lot I. White Wyandottes, Hopper Fed.		Lot II. Buff Orpingtons, Hopper Fed.		Lot III. White Wyandottes, Soft Food and Grain Fed.		Lot IV. Buff Orpingtons, Soft Food and Grain Fed.	
	Weight.	Cost.	Weight.	Cost.	Weight.	Cost.	Weight.	Cost.
	lbs.	s. d.	lbs.	s. d.	lbs.	s. d.	lbs.	s. d.
Dry mash ...	635·75	50 4	641·75	50 10·8	365·0	23 11·2	364·0	23 11·2
Wheat and barley	52·5	3 3·4	54·25	3 4·7	204·0	13 11·3	194·25	13 4·6
Matgolds ...	43·0	0 3·4	60·75	0 4·9	102·0	0 8·2	121·0	0 9·7
Green bone ...	30·25	5 0·5	30·25	5 0·5	30·25	5 0·5	30·25	5 0·5
Total ...	761·5	58 11·3	787·0	59 8·9	701·25	43 7·1	710·5	43 2·0
Average per bird	84·6	6 6·6	87·44	6 7·7	77·91	4 7·1	78·93	4 9·6

From this table it will be evident that if the results were as stated, feeding on soft food and grain in the usual manner is very much cheaper than on the hopper system. For reasons, however, explained in connection with Experiment No. I, it would be unfair to accept the figures in respect to Lots I and II as conclusive, owing to the fact that the cost was greatly decreased when boxes were fitted to the hoppers to prevent

waste, reducing the cost from 2s. 2*9d.* in the first quarter, to 1s. 1*8d.* in the last quarter.

Although the hopper boxes were not introduced until August, an estimate may be based on the 3rd and 4th quarters by doubling the cost from June 1st to November 30th, in which case the result would be :—

	Hopper fed ...	... ...	Average Cost.		Revised estimate. " "
			s.	d.	
Lot I.	Hopper fed ...	... ...	5	2 <i>88</i>	Revised estimate. " "
„ II.	„ „	... ...	5	1 <i>84</i>	" "
„ III. }	Soft food and grain ...	... ...	{ 4	10 <i>12</i>	Actual cost. " "
„ IV. }			{ 4	9 <i>56</i>	" "

Whilst, therefore, the ordinary method of feeding is cheaper than the Hopper System even when the greatest care is taken to avoid waste, the difference is not a very serious one, only 5*d.* per bird per annum, which might find its compensation in other ways, more especially where labour is costly. These experiments have, however, proved abundantly that fowls can be kept in confinement, where natural food is less abundant than if the birds are at liberty, at a cost not exceeding 4s. 1*od.* per annum, or a fraction more than the proverbial penny per week.

In all cases the cost was heaviest in the first (Winter) quarter, falling considerably in the second, with, in the case of the ordinary fed birds, comparatively little variation afterwards. Whilst in Lots III and IV the quantity of soft food was equal, the grain consumed was heaviest in the winter quarter, falling appreciably during the rest of the year, even though no mangolds were given after March 1st, 1907. Their place, however, would be taken by the grass in the runs. In respect to Lots I and II, the results are unreliable, as it is impossible to estimate how much food was wasted before the boxes were fitted to the hoppers.

Egg Production.—The dates upon which laying commenced were as follows :—No. I, December 27th, 1906; No. II, December 11th, 1906; No. III, December 13th, 1906; No. IV, December 8th, 1906.

It will thus be seen that Buff Orpingtons were a little earlier than the White Wyandottes, due to their being a few days older, but the difference was not very marked. In no case were the pullets precocious, as they were upwards of 8 months old, but no attempt had been made to force produc-

tion, and as the summer of 1906 was dry and hot, growth of chickens was somewhat slow. Table V gives the total egg production for the entire year of each of the respective lots.

TABLE V.—Egg Production.

Month.	Lot I. White Wyandottes.		Lot II. Buff Orpingtons.		Lot III. White Wyandottes.		Lot IV. Buff Orpingtons.	
	Total for month.	Average per hen.	Total for month.	Average per hen.	Total for month.	Average per hen.	Total for month.	Average per hen.
December, 1906	6	0·75	37	4·62	14	1·75	39	4·88
January, 1907	77	9·62	108	13·5	73	9·125	84	10·5
February "	107	13·38	97	12·13	98	12·25	85	10·62
March "	150	18·75	112	14·0	164	20·5	120	15·0
April "	124	15·5	105	13·12	107	13·38	81	10·12
May "	43	5·37	58	7·25	58	7·25	53	6·62
June "	92	11·5	45	5·62	51	6·375	84	10·5
July "	76	9·5	88	11·0	98	12·25	78	9·75
August "	48	6·0	39	4·88	46	5·75	45	5·62
September "	12	1·5	20	2·5	27	3·37	38	4·75
October "	—	—	—	—	—	—	—	—
November "	—	—	—	—	—	—	—	—
Totals	735	91·87	709	88·62	736	92·0	707	88·37
Range of production ...	82 to 112.		74 to 101.		82 to 108		32 to 116	
Food cost per dozen eggs ...	11·55d.		1s. 0·13d.		8·53d.		8·8d.	

It will be seen that the average production of each lot was by no means high, in no case reaching 100 per annum, but in every pen were birds which exceeded that number. Hence the importance of trap nesting to discover the drones. For reasons already stated the food cost of Lots I and II was excessive, whereas in Lots III and IV it may be regarded as satisfactory, so far as the actual expense of maintenance is concerned.

From these figures it will be evident that profit in egg production depends upon the margin beyond the actual food cost. But it may be pointed out that the birds used in this experiment consisted of breeding pens, each with one male to eight females, not merely as laying stock, but for the production of chickens, and as each female became broody once or twice, her time was partly taken up in other work. Had they been kept only as layers without any cocks the food cost would have

been reduced by at least one-ninth. But this much may be pointed out to emphasise the importance of careful selection for egg quality, that the cost per dozen eggs would be greatly reduced in accordance with increased number, as follows:—

	Lot III.	Lot IV.
	Per doz. eggs.	
Had an average of 120 eggs been laid, cost	6·54d. 6·47d.
" " " 150 "	5·23d. 5·18d.

To what extent increased egg production would involve a greater food consumption remains to be tested, but in any case it would be small compared with the reduction in average cost of eggs produced.

TABLE VI.—Egg Production in respect to Breed and Feeding.

Month.	Breeds.		Feeding.	
	White Wyandotte. Lots I and III.	Buff Orpington. Lots II and IV.	Hopper. Lots I and II.	Soft Food and Grain. Lots III and IV.
December, 1906	20	76	43	53
January, 1907	150	192	185	157
February	205	182	204	183
March	314	232	262	254
April	231	186	229	188
May	101	111	101	111
June	143	129	137	135
July	174	166	164	176
August	94	84	87	91
September	39	58	32	65
October	—	—	—	—
November	—	—	—	—
Totals	... ...	1,471	1,416	1,444
Average Production	... ...	91·9	88·5	90·25
				90·2

In spite of the fact that the Buff Orpingtons were earlier hatched, although the difference was very little, the White Wyandottes proved the better layers, but the former gave higher results in December, January, May, and September, the first two of which months are of considerable importance. The feeding did not affect laying, as there was only one egg difference in the totals, and consequently no advantage was gained in that respect.

Fertility.—Where eggs are produced for hatching a very important point is their fertility and the number of chickens

produced. Careful records were kept, which showed an average of about 79 per cent. of fertile eggs hatched.

The Hopper-fed birds were slightly higher in average fertility but the percentage hatching of fertile eggs was practically the same under both systems of feeding. Consequently either method can be depended upon to give satisfactory hatching results.

Conclusions.—So far as these experiments have gone, it is evident that feeding upon soft food and grain in litter is the cheaper method, and that birds in runs can be fed at a cost not exceeding 4s. 10d. per annum, or slightly over 1d. per week. Thus where fowls have free range on good land, they should not cost more than 4s. per annum, in which case at an average of 1d. per egg, less than 50 eggs would pay the food bill for an entire year. One danger of hopper feeding is the encouragement of rats.

The influence of the two methods of feeding upon egg production as shown in Table VI is practically the same, so that, taking into account the question of labour, if the cost of hopper feeding could be brought to the level of the other system, in many cases it would offer great advantages. Whether that can be done is still to be ascertained.

A NEW TOMATO DISEASE.

H. T. Güssow.

Tomatoes have recently been found to be attacked by a disease which had not previously been known to exist in this country. The disease in question was first reported from South America, the native country of the tomato. As far back as 1884 it was described by a well-known mycologist, Spegazzini, as attacking tomatoes grown in the Argentine. Since then it has appeared in Australia; and shortly after the introduction of tomatoes into Europe it was recorded in Italy, France, Germany and other Continental countries. From its sudden appearance in this country there can be little doubt that the fungus has been introduced from abroad with imported tomatoes. The damage which the fungus is capable of doing is very serious. A crop of outdoor tomatoes in Gloucestershire was entirely destroyed by it

last year, and growers are cautioned to be on the lookout for this pest, which, if neglected, may become one of the most serious sources of injury to the crop.*

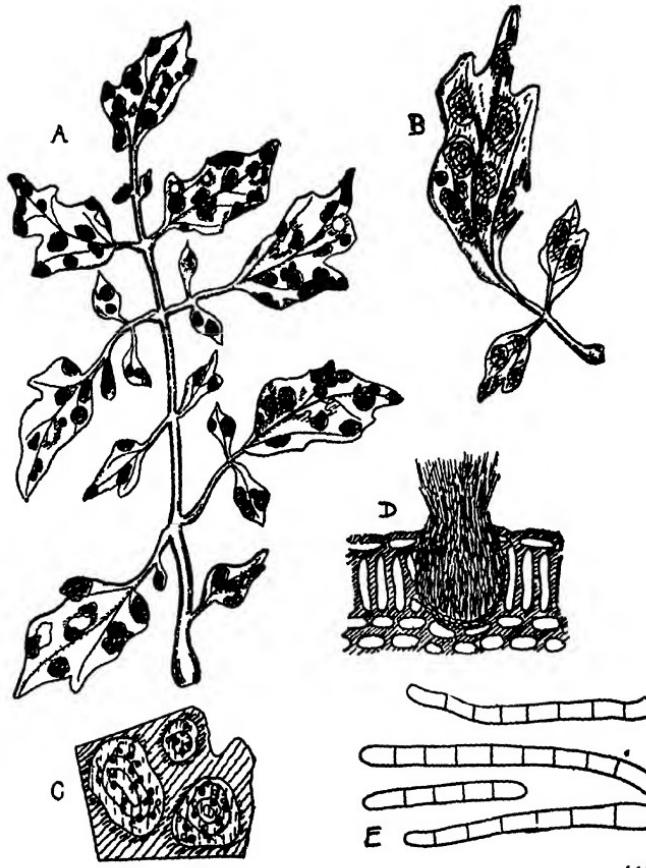
The fungus which causes the disease is closely related to the "leaf spot" disease on strawberries, apples, pears and chrysanthemums, but is quite distinct from any of these diseases and it has been proved that spores of the fungi causing "leaf spot" on the plants named above are incapable of producing this particular disease on tomatoes. In the same way, experiments made with the object of infecting potatoes and other plants with spores from this tomato fungus have not resulted in any injury. Spegazzini gave it a distinctive name, *i.e.*, *Septoria Lycopersici* (*Fungi Argentini*, Preg. iv. n. 289), but in the opinion of other mycologists it ought to be termed *Septoria Lycopersici* var. *europaea*, Briosi et Cavara.

The tomato plants attacked show small blackish-green spots on the leaves. These are irregular in shape at first, but soon become concentric and finally confluent, and the leaves, which are rapidly killed, roll up and hang loosely from the stem. The fungus also attacks the stem, the calyx and finally the fruit itself. When no remedial measures are taken the whole plant may be destroyed within seven days from the first sign of the disease.

The spores of the fungus germinate during June and July, the mycelium pierces the surface of the leaves and rapidly branches in the interior. The injured portions quickly discolour and small spots appear externally. The dead tissues, especially in tomatoes grown indoors, dry up and exhibit spots of a somewhat dark brown colour, which appear hard and parchment-like. In tomato plants cultivated out-doors the spots are softer and black. When the dead portions of a leaf are examined by means of a pocket lens one can easily detect numerous minute black bodies not larger than the point of a needle all over the surface of the leaf. At the same time one can distinguish a light brown-coloured substance rising from the apex of each small body like a curled, twisted thread. The manner in which this substance rises from the bodies may serve as a character to distinguish this disease from others.

* The disease has reappeared this year, and precautions should be taken to prevent its spread.

Under the microscope the minute black bodies are recognised as the fruiting body of the fungus, and the light brown mass is found to consist of spores. These spores are exceedingly small, measuring about $\frac{1}{14}$ th of an inch in length and $\frac{1}{2,000}$ th



A.—Tomato leaf attacked by the fungus *Septoria Lycopersici*, Speg.

B, C.—Portions of diseased leaf (magnified).

D.—Section through leaf, showing fruiting conceptacle (magnified).

E.—Spores of the fungus (highly magnified).

of an inch in breadth; they are divided into several divisions, numbering from three to eleven. When the leaves are dried up the spores fall to the ground, and are carried about by the air or adhere to the glass, woodwork, poles, &c., where they pass through the winter. They germinate next year again on tomato

plants on finding suitable conditions for their development. How easily the disease propagates and spreads will appear from the following experiments :—

Diseased portions of leaves were placed in a small bottle with water and were well shaken. This water, which contained an enormous number of spores, was used, on August 11th, to spray a healthy tomato plant, with the result that, on August 16th, spots were noticed on the leaves and young shoots of the plant. The whole foliage, stem and young fruits were covered with spots by August 20th. Within five days from spraying, ripe spores had formed in large numbers. Where diseased leaves came into contact with healthy neighbouring ones, these immediately contracted the disease. At first it was possible to check the disease on adjacent plants by removing the diseased leaves, but the plants soon became so diseased that the cutting away of the leaves could no longer be practised with any beneficial result. This observation tends to prove that the spores are the main carriers of the disease. Spores placed in water germinate readily after a few hours, sending out a germinal tube from one and more of the divisions ; they also germinate easily either on the surface of the leaf or on the main stem and shoots.

For the purpose of ascertaining the strength of a spray necessary to combat the disease, three grades of Bordeaux mixture were prepared, viz. : (a) 1 per cent., (b) 2 per cent. and (c) 3 per cent. solutions.

Infected material with numerous spores was placed in the 1 per cent. solution, and healthy plants immediately sprayed after the spore material had been immersed not longer than one minute. A small ball diffuser was used, and the whole process of spraying took no longer than about three minutes. The same process was repeated with the remaining grades of the solution. The results obtained were most striking. None of the experimental plants took the disease, whilst plants sprayed with the same spore material in water developed the disease in six days. One of these plants was sprayed immediately after the appearance of the disease with a 3 per cent. solution of Bordeaux mixture ; another was sprayed at a later stage of disease, and a third at a still more advanced stage. A 3 per cent. solution was used throughout, but the

disease was only arrested in the plant showing the first signs. The plants sprayed at a later stage showed signs of a check, but, though the spraying was continued, the disease broke out again and again. On microscopic examination it was found that the tissues of these plants were permeated by the mycelium to such an extent that the spray did not kill the whole of it, and in a few days the fungus had recovered its vigour and the disease reappeared. This emphasises the necessity of keeping a close watch upon the plants, and spraying immediately the spots appear. Spraying with a 4 per cent. solution resulted in injuries to young leaves and shoots, and should not be practised.

The following points may be gathered from these experiments :—

(1) Plants once attacked can only be saved when sprayed immediately the first signs of disease are noticed. The plants should be sprayed with a 3 per cent. solution of Bordeaux mixture early in the morning every second day for two weeks. The spray should be in the form of a fine vapour falling upon the plants like a natural dew.

(2) Badly attacked plants might be cut back, or, better still, uprooted and burned.

(3) Any wires and props used in the houses should be slowly drawn through fire, in order to kill the spores adhering to them.

(4) The top soil should be removed and mixed with fresh lime, in the proportion of about one barrowful of lime to five of the soil. It can be replaced after the lime has slaked.

(5) When planting young tomato plants, pulverised lime should be scattered on the ground round the stems.

(6) Tomato seed from infected areas should not be used, but if it is it should be steeped for one hour in a 5 per cent. solution of copper-sulphate and dried before sowing.

YELLOW RATTLE.

(*Rhinanthus Crista-galli*, L.)

A weed which is frequently a considerable trouble to farmers is that known by the common names of Yellow Rattle, Rattle Grass, Cock's-comb, or Horse-penny, its botanical name being *Rhinanthus Crista-galli*, L.

Description.—Yellow Rattle is a somewhat peculiar looking plant, occurring as a weed in grass land, especially in damp or wet meadows and pastures, where it is partially parasitic on the roots of grasses, &c. It is an erect-growing annual belonging to the Order *Scrophulariaceae*, and bears narrow serrated leaves, which are placed opposite one another on the smooth, quadrangular stem and its branches. It may attain to 18 inches in height, and bears numerous flowers arranged in spikes, on which the flowers are turned in all directions. The corolla of the flowers is yellow, the upper lip being the longer and the lobes blue; the lower lip has three lobes, and with the toothed appendages on the sides of the upper lip gives the flower a peculiar and characteristic appearance. The red-tipped calyx, after the fall of the corolla, resembles a Cock's-comb. The shape of the flower also gave rise to the name *Rhinanthus*, taken from the Greek words *rhis*, *rhinos*, the nose, and *anthos*, a flower, literally therefore the nose-flower. Flowering takes place about May to June or July. The seeds are winged and are borne in roundish compressed, two-valved capsules, in which they rattle when shaken, thus originating two of the common names of the weed.

Distribution.—This weed is found throughout the British Islands as far north as Shetland, and in the Scottish Highlands occurs as much as 2,500 feet above sea level. It is also found in Northern Europe, North Asia, and North America. Several cases have come to the notice of the Board in which Yellow Rattle has been the cause of much trouble and annoyance.

Injurious Effect.—Yellow Rattle is semi-parasitic on the roots of grasses and various herbs, and according to Güssow* experiment has shown that it cannot be cultivated entirely by itself. It certainly does not grow satisfactorily unless partially parasitic on other plants. Where it occurs extensively therefore much harm will be done to the meadow or pasture, space being taken up and good plants crowded out, food materials being absorbed from the host-plants by the haustoria of the Yellow Rattle, while the plant is not liked by stock and reduces the value of the hay in which it may occur. It has been stated that the seeds of Yellow Rattle when ground up with wheat discolour and impart an unpleasant taste to bread made from the flour,



Mr. J. W. Cobb

YELLOW RATTLE (*Rhinanthus Crista-galli*, L.).

while it is also believed by some people to impart a bad taste to the butter made from the milk of cows grazing in fields where it occurs.

Henslow writes* of Yellow Rattle : “ If the seeds are ground up with the corn they impart a violet-brown colour to the flour. This is due to a property called Rhinanthine. It is not known whether this principle has really poisonous properties or not ; but if so it is probably only after prolonged usage.”

Soil and Situation.—The weed is generally regarded as a weed of poor meadow land ; well drained, closely grazed and well cared for rich pastures and meadows seldom being infested. Mr. J. P. Sheldon wrote in 1907† that an abundant growth of Yellow Rattle “ appears to be promoted by a prevalent low temperature in the period when grass in meadows is—or ought to be—a little past the middle of its growth. In a warm and ‘ growing ’ state of weather at this period all meadows worth their salt fill up with bottom grass, and the Yellow Rattle is not seen. Curiously enough, this weed is seldom if ever seen on permanent pasture land.”

Thaer says‡ that well-drained pastures seldom suffer, but chiefly poor pastures by streams which are fed more by stagnant water than by drainage waters.

The Board last year received specimens from Willingdon in Sussex, where the weed was over-running land on chalk under down grass.

Remedial Measures.—The general character of Yellow Rattle is such as to render it a very undesirable invader of grass land, and immediate measures should be adopted to eradicate it. One of the first methods which suggests itself is to mow the weed early before the seeds are ripened, and this is probably the best method of getting rid of it. Where land is intended for hay this mowing must take place early. It has been clearly shown that early mowing for two years in succession, so preventing seeding, has been followed by entirely satisfactory results.

Stock do not appear to like the plant, but close grazing with sheep seems to be useful. Thaer recommends depasturing with

* *Poisonous Plants in Field and Garden*, Rev. Professor G. Henslow, p. 139.

† *Ag. Gazette*, July 8th, 1907.

‡ *Landwirtschaftliche Unkräuter*, p. 36.

sheep early in the spring, so that the year's growth of the weed is destroyed.

It may be said that on heavy land a dressing of 7 cwt. of basic slag applied before the end of November will encourage a luxuriant growth of clover, and if such pasture is closely grazed by stock the Yellow Rattle, as well as other weeds, will be prevented attaining its normal growth and will soon disappear. Such an application of basic slag is only calculated to have the best effect if the field is grazed, not mown for hay, and the manuring and grazing must therefore be combined.

Top-dressings of salt at the rate of 5 to 7 cwt. per acre have, in some cases, proved very effective. Percival remarks that "top-dressings of salt tend to destroy it."

Grazing with sheep in April, accompanied by a dressing of 6 cwt. per acre of salt, is stated to have had good results, a field infested in 1896 producing no Yellow Rattle in 1897, the year in which treatment took place.*

When the plant affects damp ground, as in damp, low-lying meadows and pastures, draining would be a useful measure.

Where the weed is spread over a pasture it has been recommended that the land should be broken up in order to take one or two root crops to clean thoroughly and again lay down to pasture. It is, however, doubtful if this is ever necessary, and owing to the expense involved the measures recommended above would be preferable.

Description of Plate.

Flowering plant, showing root, stem, leaves and flowers. Also : (1) Section of calyx with pistil ; (2) Corolla laid open ; (3) and (4) Stamens ; (5) Section of fruit : (6) and (7) Seed. (1) to (5) and (7) enlarged, (6) natural size.

Comparatively few specimens have been sent to the Board during the past month, but several of these are of considerable interest.

Notes on Insect, Fungus, and other Pests.†	<i>Aphides.</i> —Specimens of black currants from Matlock Bath bore the oval black-brown glossy eggs of a species of <i>aphis</i> . Winter washing with the following
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* *North British Agriculturist*, October, 1897.

† Notes on insect, fungus and other pests, dealing with the specimens submitted to the Board for identification, and their apparent prevalence, will appear in this *Journal* month by month. The notes commenced with the issue for June, 1907.

Woburn wash would be of much value against aphides on currants, this wash being an improvement on that given in Leaflet 68 in 1904. It is composed of paraffin, 5 pints; sulphate of iron, $\frac{1}{2}$ lb.; caustic soda, $2\frac{1}{2}$ lb.; lime, $\frac{1}{2}$ lb.; water to make 10 gallons.

The wash may be prepared as follows:—

(a) Dissolve the sulphate of iron in about 9 gallons of water; (b) shake the lime in a little water and then add a little more water to make this into a "milk"; (c) run *b* into *a* through a piece of coarse sacking to remove grit; (d) churn the paraffin into the mixture; and (e) just before using the wash add the caustic soda in the powdered condition and stir thoroughly.

The Board understand that this wash can be purchased ready made up at 1s. 3d. per gallon. The wash may be used during February and March so long as the plants are dormant and cold weather prevails.

The bushes should be kept under observation, and if any eggs escape and hatch, spraying should be carried out at once with paraffin emulsion before the aphides procure shelter under the infested curled-up leaves.

Specimens of apple trees infested with woolly aphis (Leaflet No. 34) were received from Longhope, Glos., and bore swollen places on the smaller branches due to irritation set up by the aphides.

Diseased Thorn.—Specimens of a diseased double pink thorn were received from Midhurst. It was found that swellings present on the thorn were due to the presence of a fungus known as *Gymnosporangium clavariaeforme*, Jacq., which is parasitic on different host-plants during different periods of its development. One stage forms spindle-shaped swellings on the branches of the common Juniper and allied species, and during the months of April and May numerous pale orange-coloured gelatinous masses ooze out of these swollen places. These gelatinous masses are the spores of the fungus, which are distributed by wind, insects, birds, &c., and those that happen to alight on young thorn shoots give rise to the swollen portions, which, in due course, produce the spores of the second condition of the fungus. These spores cannot again directly infect the thorn, but can infect Juniper and give

origin to the first form of fruit. The spores of the Juniper condition, in like manner, cannot directly infect another Juniper plant, but only a thorn plant. From this it is evident that if either of the host-plants of the fungus is removed, the injury will cease to exist. A careful examination of the Junipers growing within a distance of, say, 500 yards, of the diseased hawthorns, will undoubtedly reveal the presence of swellings on some of the branches. These should be removed and burnt.

Diseased Straw.—Specimens of imported diseased straw were received from Cardiff, and were found to be infested with the yellowish plasmodium condition of a species of *Badhamia*, one of the *Myxogastres*. Owing to the immature condition the exact species could not be determined.

Violet Root-Rot on Potatoes.—From Longniddry (E. Lothian) specimens of potatoes were received and found to be infested with the disease known as Violet Root-Rot, *Rhizoctonia violacea*, Tul., an account of which is given in Leaflet No. 171.

When placed in storage the tubers affected had sweated a little, and the fungus commenced growth afresh. After the surface of a tuber is once broken, various kinds of fungi and bacteria hasten the decay, and the spores are conveyed from one tuber to another by mice, woodlice, centipedes, &c.

Other specimens received were apple shoots from Longhope (Glos.), showing the typical concentric cracks due to the canker fungus *Nectria ditissima*, Tul. (see Leaflet No. 56); and larch saplings from Buckingham attacked by larch canker (Leaflet No. 155).

The success which has attended the treatment of peat soils with artificial manures on the Continent has recently been described

in this *Journal* (June, 1907, p. 146), and
Manuring of Peaty Land. a leaflet on the subject has since been issued. An example of what might

be done in this direction in Great Britain is afforded by the experiments carried out by the Agricultural Department of Armstrong College at Glasson and Southerfield in Cumberland. There are very large areas in Cumberland, lying to the south of the Solway, of level marshy and peaty land, most of which has probably at no distant period been covered by water; for example, Bowness Common (3,270 acres),

Drumburgh Moss (384 acres), Wedholme Flow (1,782 acres), the peat moss on Holme Dub and to the west and south-west (2,000 acres), while in addition there are similar areas further to the east and north-east of the county of Cumberland.

Experiments at Glasson.—This soil is of a very peaty character, and is typical of a great deal of similar land in this district. It is very rich in available phosphates and potash, and contains as much as 2·25 per cent. of lime, or the equivalent of about 4 per cent. of carbonate of lime. While it contains about 60 per cent. of organic matter, the earthy matter distributed throughout the peaty fibre is of a valuable character, and it is a remarkably fertile soil from a chemical point of view.

On this peaty soil 1 cwt. nitrate of soda applied annually over thirteen years has given an annual loss of about 8s. per acre. Superphosphate alone has done better than slag alone, but in complete manures, slag has given distinctly better results. Further, nitrate of soda has done distinctly better than sulphate of ammonia in complete manures. When, however, lime was applied, sulphate of ammonia gave better results than nitrate of soda. Dung has not given good results, although its application in the later years has become profitable. Undoubtedly, basic slag is the most effective manure at this centre, especially in improving the herbage and developing clover plants, but the results indicate that it requires a potash manure along with it to become really effective on this soil.

Experiments at Southerfield.—The plots here are on moss land of a very peaty character, which has recently been drained. On adjoining land the plots are duplicated on similar soil lying under pasture, which has been drained for a considerable time. As the great bulk of this land is now growing herbage of the very coarse character usually found on poor reclaimed moss, these trials are of great importance.

The experiments extended over the three years 1905–07, but as the hay was not weighed on these plots in 1907, the results cannot be given for this latter year.

On plot 2, which has been untreated throughout, the herbage is of a poor character, consisting principally of the coarse sedges and grasses characteristic of peaty land, with practically no trace of leguminous herbage. Two tons of lime per acre, applied to plot 1 in 1905, had practically no results in that

year, but increased the crop by nearly 5 cwts. in 1906. An inspection of the plots in the autumn of 1907, however, showed that lime had done little to improve the character of the herbage.

Plot.	Manuring.	Average Annual Cost of Manures, (3 Years.)	Average Weight of Hay per Acre, 2 Years.	Increase over Plot 2.	Average Annual Gain or Loss (-).
I	2 tons lime, 1905	s. d. 8 4	Cwts. 15	Cwts. 2½	s. d. - 2 1
2	No manure	—	12½	—	—
3	10 cwts. slag,* 1905	7 11	16½	4	2 1
4	10 cwts. slag, 2 cwts. muriate of potash,† 1905	13 9	25½	13	18 9
5	½ cwt. nitrate, 4 cwts. superphosphate, 2 cwts. kainit, 1905 and 1906	13 5	26½	14	21 7
M	10 tons dung, 1905	16 8	32½	20½	33 11

* Containing 200 lb. phosphoric acid.

† Containing 100 lb. potash.

On plot 3, 10 cwts. basic slag were applied in 1905 and the results are good. The hay was greatly increased in the first and especially in the second year after its application, and the result is a small annual gain. In September, 1907, it was evident that the herbage was greatly improved on this plot. Finer grasses have largely taken the place of coarse grasses and sedges, and there is just a little clover development. On plot 4, 10 cwts. slag and 2 cwts. muriate of potash were applied in 1905. Here the results are of a still more satisfactory character. The increase of hay was so great in the first two years that a net gain of 18s. 9d. per acre per annum has resulted. In addition to this, the inspection, last September, of the plots showed that the improvement by slag only was carried to a far greater extent on this plot, and that some white clover plants had also developed. On plot 5, a medium dressing of nitrate of soda, superphosphate and kainit was applied in each of the years 1905 and 1906. As a result, the crops of hay were greatly increased, and excellent gains per acre are shown for these years, but the herbage was of a very coarse character and has practically not been improved in quality. On the sixth plot (M) 10 tons dung were applied in 1905. This has given considerably the heaviest crop of hay in the first two years, which, however, was of an even coarser character than that produced on

plot 5. Although, therefore, an excellent gain per acre is shown in the table, this cannot be looked upon as a satisfactory result, as last autumn the herbage of this plot was as rank and coarse as that found on the untreated plot. The results obtained on the pasture plots were very similar.

Summary.—Professor Gilchrist observes that it is very remarkable that although lime is usually effective on peaty soils it has not been so on these soils, either at Glasson or at Southerfield, and this is probably accounted for by the fact that these soils seem to contain a larger amount of lime than is usually found in peat. In this connection it is interesting to note that in the previous article in this *Journal*, it was stated that Continental experience had shown that "lime is generally unnecessary, though it is useful in some cases to sweeten the soil and hasten decomposition. Experiments in Germany have shown that its place, especially in the early years, can well be taken by basic slag." At Glasson the results indicated that the small amount of lime present in slag was of great service and that quite a small amount of lime per acre—such as is usually contained in slag—may give really good results.

At Southerfield 10 cwts. slag of good quality and 2 cwts. muriate of potash were remarkably effective in improving both meadow and pasture land where the herbage was of a very coarse character; and the same has been found to be the case at Glasson. The results at both these centres indicate that the judicious use of basic slag and a potash manure should be of the greatest service in improving these areas of peaty land. It is probable also that the increased use of basic slag on such soils, which are under arable crops in Cumberland, would be of the greatest service, and also that where dung is not used a potash manure would be a useful addition to slag.

An experiment was commenced in 1902 at the Harper-Adams Agricultural College to compare the growth of trees

Effects of Grass on Apple Trees.* when planted on grass or on cultivated ground. The grass upon which the trees are planted is manured regularly with farmyard and artificial manure, the grass

* See *Journal*, Vol. XII, p. 492, November, 1905, and p. 558, December, 1905; Vol. XIV, p. 42, April, 1907.

mown and removed, while special artificial manures are used for each crop on the cultivated portion, in addition to farmyard manure, thus giving equal conditions as to manure for the trees on both plots. The difference between the trees on grass and those on cultivated ground has been very marked, as will be seen from the following table, showing the average diameter in inches of the trees at a distance of $4\frac{1}{2}$ ft. from the ground.

Variety of Apple.	Average Diameter in Inches.					
	Grass.			Cultivated Ground.		
	1905.	1906.	1907.	1905.	1906.	1907.
Bismarck...	1.03	1.05	1.18	1.31	1.62	2.01
Bramley's seedling	0.78	0.81	1.04	1.20	1.50	1.91
Cox's orange pippin	0.82	0.86	1.01	1.11	1.40	1.83

The wet season of 1907 benefited the trees on grass to a marked extent, for while in 1906 the proportionate increase was 1 in the trees on grass to 10 in the trees on cultivated ground, the increase in the past year was 4 in the trees on grass to 10 in the trees on cultivated ground. Insufficient moisture seems, therefore, to be one of the causes of the poor development of trees planted in grass.

At the commencement of 1907 the experiment was modified by removing from around the stems of alternate trees on grass a square of turf. The surface ground laid bare (4 sq. yds. to each tree) was forked without disturbing the roots, and kept free from weeds throughout the year. The effect of this treatment was soon visible, the growth made during the summer was strong and healthy, and the increase in the thickness of the main stem was also marked. On the whole the growth was nearly equal to that made by the trees in cultivated ground, and very much greater than that made by the trees with grass all around the stem.

In an address to the Royal Scottish Arboricultural Society, Dr. Somerville drew attention to experiments made in Austria

**Influence of
the Character of
Seed on the
Growth of Trees.**

and Switzerland to test the influence of elevation on seed of the spruce and larch. In the case of the Swiss experiments, an examination of the seed procured from trees of approximately equal age situated at different elevations

showed that there was a gradual, though by no means regular, reduction in size according as it was obtained from low or high elevations ; for instance, it was found that 1,000 seeds usually weighed more than 6 grammes when obtained from an altitude under 3,000 feet, and less than 6 grammes when the altitude was 3,000 to 6,000 feet. The percentage germination followed the same order, being 70 to 80 for lower altitudes, and 50 to 60 for higher altitudes. It was also clearly shown that there was a relationship between the rate of growth of the seedlings and the elevation at which the seed was gathered. As is well known, above a certain altitude the growth of trees in height is affected and at the upper levels the trees became more or less stunted. These experiments showed that this reduction in the stature of trees is a character that is inherited, for example plants from seed gathered at a height of 1,800 feet were 18 inches high after 5 years, while seed obtained from levels between 5,000 and 6,000 feet only produced plants 9-10 inches high. Similar results were obtained in Austria, where spruce gathered and sown at an altitude of 1,700 feet attained a height of 53 inches after 15 years, while seed sown in the same nursery but gathered at a height of 5,200 feet only gave plants 30 inches high. The height-growth in 1905 was also smaller, so that fifteen years after sowing the seed the slower growth of plants from seed harvested at a high altitude was still conspicuous, and it seems probable that this characteristic will be maintained throughout the life of the tree. A number of other trials were made besides those mentioned, and also some with larch and sycamore, which confirm the conclusion as to the transmission of the tendency to slower growth. The converse is also true, for seed from low elevations produced plants that thrived badly at high altitudes. For use at high altitudes, seed

from similar altitudes must be obtained, and Dr. Somerville thinks it not unlikely that woods could be grown in Scotland at greater heights than at present if high-grown coniferous seed were obtained for the purpose. Generally seed should be obtained from well-grown healthy trees situated in the district where the woods are to be grown, or in a district of similar character.

The most suitable soil for the growth of osiers is a deep, rich, moist, alluvial soil, but an example of how well osiers will grow on other soils and under comparatively unfavourable conditions is shown by their successful cultivation

Osier Cultivation. on the Atlantic seaboard of the island of Harris.*

The soil is partly deep peat, partly a loam of peat and boulder-clay debris, and partly a poor, brashy, gravelly boulder drift of an exceptionally hungry nature. The extent of land planted was small, being only one-eighth of an acre. In March, 1905, the plot was planted with cuttings of Merrion osier, 30 in. by 24 in. apart. This osier has been identified as *Salix viminalis*. All the sets rooted well, but when about 3 or 4 ft. high were much disturbed and loosened by strong winds. In February, 1906, the crop was cut, and weighed 1,022 lb. green off the stool. This was equal to 3 tons 13 cwts. per acre, which is a heavy crop for a first cutting. The second crop was cut in January, 1907, and weighed 1,753 lb., or 6½ tons per acre; while it is stated that the yield in 1908 is anticipated to amount to 10 tons per acre. More plots are being planted out with other varieties. The best results appear to be got from the use of two-year-old cuttings, costing from 9s. to 12s. per 1,000. About 17,000 are required to plant an acre, and they must be fenced against farm stock and rabbits.

An interesting account of osier growing under more usual conditions is given in the *Quarterly Journal of Forestry* (April, 1907), where the results obtained from an osier bed situated on an island in the bed of the River Thames opposite Isleworth are described by Mr. B. V. Ramaiengar.

The area of the osier bed is about 6½ acres, and being in the tidal portion of the river, it is flooded during high tides. The

* *Journal of Royal Scottish Arboricultural Society*, Vol. xxi, Part I, 1908.

soil is a rich stiff loam, being the accumulation of alluvial deposits brought down by the river. The common osier (*Salix viminalis*) is grown to produce rods fit for making small baskets. The area has been an osier bed for a very long time, and some of the old stools are about 2 ft. in girth, perfectly sound and yielding as good rods as ever. On one of the old stools nearly seventy-five shoots were counted. The stools stand roughly about 18 in. apart, so that there are 19,000 stools per acre.

The harvesting of the crop is commenced in the latter part of December or early in January, and is completed in about five weeks. Care is taken to cut the rods clean close to the edge of the stool, and the rods are then sorted into sizes and stacked until Easter, when they are peeled.

Planting is done soon after the crop is harvested, *i.e.*, about the middle of February. The best one-year-old shoots are used, and are merely stuck about 9 in. deep into the ground. Weeding is done about the end of May. The bulk of the crop is used for making small baskets for use on an adjacent farm.

The crop is sorted into the following classes which are stated to be those now used on the London market: (1) rods over 11 ft. in length; (2) rods 9-11 ft.; (3) rods 7-9 ft.; (4) rods 5-7 ft.; and (5) rods below 5 ft. in length. The first four are peeled by means of a simple instrument called a "brake," but the last class is not peeled.

All the operations are carried out by piecework:—

Cutting.—The cost of cutting is 6s. per score of bolts of various sizes. These are generally about 20 in. in circumference near the butt end.

Sorting.—The sorting costs 5s. per score of bolts of 40 in. in circumference.

Peeling.—The cost of peeling varies according to the class of bolts, but average about 10d. per bolt.

Basket-making.—It costs 7½d. to make a bushel-size basket having alternate bands of peeled and unpeeled rods.

Planting.—The cost of planting is 2s. 6d. per 1,000 cuttings.

Weeding.—This costs £5 annually for the whole area.

Yield.—The yield is 750 bolts of green unpeeled rods of 40-in. girth near the butt end, *i.e.*, 115 bolts per acre. These 750 bolts of unpeeled rods yield 60 bolts of peeled rods of the first size, 500 bolts of peeled rods of other sizes, and 100 bolts

of unpeeled rods of the "small" size. With these 600 bolts, 5,000 baskets are made for use on the farm. The average weight of a bolt of peeled rods (in August) is 56 lb. and of a bolt of "small" rods 28 lb., the total yield being at the rate of 2 tons 7 cwts. per acre.

The accounts for 1905 showed a net revenue of £15 7s. 8d. per acre.

For further information as to the cultivation of osiers, reference should be made to Leaflet No. 36, and to an article in this *Journal* (April, 1907, p. 47) on osier cultivation in Holland and Belgium.

The possibility of improving the present condition of forestry in Ireland has been under the consideration of a Departmental Committee, and the Com-

mittee has now made an exhaustive **Forestry in Ireland.** report* dealing with existing conditions and recommending the adoption of a national scheme of Afforestation. It is pointed out that a comprehensive scheme of forestry, whether undertaken through local authorities, private owners, or directly through a Forestry Department, can only be carried out by or under the direction of the State. An exceptional opportunity for acquiring land suitable for forestry, and not so suitable for any other use, presents itself now in Ireland, in connection with the Land Purchase Acts; and such a scheme, including the preservation and extension of existing woods, and the creation of a new forest area, would be, the Committee consider, a sound investment for the nation.

As a result of certain surveys it is estimated that there is available a total possible forest area of at least 1,000,000 acres, made up in round numbers of 300,000 acres of existing woodlands; 200,000 acres of plantable land in large blocks; and 500,000 acres of plantable land in smaller blocks.

Legislation is not necessary for the establishment of a Forestry Authority, as the Department of Agriculture is endowed with the necessary legal powers for aiding, improving, and developing forestry, but the Forestry Section of the Department would need to be strengthened and developed and

* Report, Cd. 4027. Price, 6½d. Minutes of Evidence, Cd. 4028. Price, 4s. 5d.

special funds provided in the event of the proposed scheme being sanctioned.

It is suggested that the scheme should provide for the acquisition by the Forestry Authority of 200,000 acres of plantable land, in large blocks, to be planted, managed, and maintained in the interests of the country as a whole, as State forest; and that the Forestry Authority should also acquire and manage the larger woods passing from the hands of their present owners under the Land Purchase Acts. The smaller woods which are passing from their present owners could be more economically managed by the County Councils, and such woods, other than those small enough to be allotted with tenant-purchasers' holdings, might be acquired by the County Councils and managed by them, in the interests of their respective counties, subject to the expert advice and supervision of the Forestry Authority. Advances under the Land Acts could be made to the County Councils, as trustees, to enable them to acquire such woods and small lots of plantable land in connection with them.

It is also proposed that increased encouragement should be given to private owners to plant portions of their holdings. In the case of the smaller holders, such encouragement might take the form of an extension of the county horticultural schemes under the County Councils and the Department of Agriculture; and, in the case of the larger holders, of an extension of the system of Board of Works' loans.

Effective provision for the training of working foresters and woodmen has already been made at the Forestry Station at Avondale under the Department of Agriculture, and partial provision for higher training at the Royal College of Science, Dublin; but the extension of this provision is regarded as desirable.

Another point contemplated in the Report is the proper organisation of the timber trade in the interests of the grower and the manufacturer, and the further development of forest industries.

The net expenses of the national scheme of afforestation recommended, including the purchase of the land required, are estimated to amount to £44,525 per annum in the first decade, to £66,725 in the second decade, to £74,600 in the third, to £67,100

in the fourth, and to £32,600 in the fifth, after which period the scheme provides a surplus over purchase annuities and working and administrative expenses, eventually yielding a return of 4½ per cent. on the total capital invested. It is suggested that the proceeds of the Irish Quit and Crown Rents might be appropriately utilised for promoting forestry in Ireland; and would suffice to finance the national scheme with the exception of a sum of £13,600, which would require to be annually provided by Parliament for five decades, and £8,600 for the sixth decade, after which a surplus would be available.

Agricultural research in Austria owes its initiative to private enterprise some 50 years ago when two experimental stations were established by local societies. In

Agricultural Experiment Stations in Austria.* 1869, however, the subject was taken up by the Government, and two State institutions for research in agricultural chemistry were founded at Vienna and

Görz. Subsequently a separate station was established at Vienna for agricultural bacteriology and plant diseases, as well as a forestry station at Mariabrunn, an agricultural station at Spalato, and a seed control station at Vienna. These, however, did not interfere with the institution of private undertakings relating to special branches, such as the sugar and brewing industries, or of others founded and supported by provincial bodies and agricultural societies.

The chemical station at Vienna in its earlier years limited itself largely to the analysis and control of fertilisers and feeding stuffs, and this still forms an important part of its work, 18,370 tests of various kinds being made in 1906, as well as 29,089 milk tests. Experimental investigation was, however, gradually developed; one section was devoted to bacteriology, another to plant cultivation, and a sub-station, with grounds and glass-houses, was established at Kornenburg, some ten miles from Vienna. In 1901, in view of the progress made in Sweden and Germany in regard to the cultivation of moorland, a section was established to deal with this subject, and in 1904 a moor-farm at Admont was given to the station

* *Zeit. für das Land. Versuchswesen in Oesterreich*, May, 1907.

both for experimental purposes and with a view to affording a practical object lesson to agriculturists. The area of the farm is about 35 acres, divided into about 25 half-acre plots for the growth of ordinary crops, small experimental plots covering about 5 acres, a forest nursery, and vegetable and botanical gardens. Experimental and demonstration plots have been established elsewhere. Other sections of the Vienna station are devoted to research in connection with wine growing, dairying, fishing, and technical chemistry.

In 1902, the section relating to bacteriology was separated from the chemical station, and established as a semi-independent branch for agricultural bacteriology and plant protection. An important part of its duties has been the organization of arrangements for the prevention of plant diseases and insect attacks. With the assistance of the provincial authorities, a number of "information bureaux" have been created in different parts of the country, which advise as to the steps to be taken against insects and fungi, and, in important cases, undertake the direction of measures against them. Subsidiary to these centres there are a large number of honorary "reporters," chiefly farmers, gardeners and fruit-growers, whose duty it is to furnish particulars as to the occurrence of pests. There are at present 30 centres and 1,060 reporters, but the increase of these numbers is contemplated. The bacteriological station keeps in touch with and assists these reporters and centres, gives information and advice, distributes leaflets and supplies information to the press.

Another central institution in Vienna is the seed testing control station, which was originally established in a very small way by the Royal Austrian Agricultural Society in 1881, with the help of a small State grant. It grew, however, very rapidly, the number of tests made increasing from 122 in 1881 to 9,801 in 1891 and to 16,770 in 1895. The number of samples tested has since doubled. In the last named year it was made a State institution, and its functions were extended to include investigation and research in agricultural botany. A large number of trials are carried on with different varieties of plants.

As regards the seed testing part of its work, an arrangement is made whereby certain firms of seedsmen enter into an undertaking with the authorities of the station to sell their

seeds with certain guarantees of purity and germination based on the results of analytical tests made at the station of samples submitted by them, and agree to accept the results of examinations made at the station of samples taken by the buyers from the goods sold as settling any question which may arise after delivery. The quality of seeds in bulk is also certified by drawing samples on the seedsman's premises, and furnishing tags to be attached to the sacks giving the results of the examination.

The agricultural experimental station at Görz was founded in 1869 for the purpose of assisting the silk industry, but in 1891 its objects were extended so as to include agriculture generally, with special reference to the two principal branches in the southern provinces of Austria, viz., the breeding of silk-worms and the production of silk, and also the cultivation of the vine. The similar institution at Spalato is, in the same way, intended to aid agriculture in Dalmatia, but courses for instruction are also held there.

The work of the United States Department of Agriculture, though in some degree administrative, is primarily of an experimental and scientific nature,

The United States Department of Agriculture. directly designed for the encouragement and advancement of the agricultural industry in that country. Original investigation into all questions affecting farming may perhaps be said to be the guiding principle on which the work of the department is conducted. This aspect of its duties has been increasingly developed of recent years, and in his Annual Report for 1907, Mr. James Wilson, the Secretary of Agriculture, points out that fundamentally the work of the department is concerned with the production of wealth, as, for example, by increasing the yield of crops by plant breeding; with the preservation of wealth, as by suppressing insect and fungus pests; and with the welfare of the industry, as by promoting co-operative selling or by giving to the public information of the size of a crop in order that demand may be fairly adjusted to supply.

It is interesting to notice that an attempt seems to have been made to express in money the value of the work of the

Department of Agriculture to farmers. A calculation was presented to a Committee of the House of Representatives which put its annual value at \$232,000,000, and Mr. Wilson in one part of his Report observes that "as the annual appropriation for the Department is about \$14,000,000, it will be seen that this is a return of about \$16 50 c. for every dollar appropriated by Congress."

In the Bureau of Animal Industry the duties are largely concerned with the inspection of meat and the control of contagious diseases. The eradication of the cattle tick which transmits Texas fever has been undertaken, and ultimate extermination of this pest is considered practicable. Sheep scab has been reduced, and the disease of horses known as *maladie du coït* or dourine has been quite stamped out. Investigations are being made into tuberculosis in cattle, and into hog cholera ; it is believed that a comparatively certain method of protecting pigs against this latter disease has been secured. The distribution of vaccine to prevent blackleg in cattle has been continued with good results, and this disease is becoming much less of a menace to young cattle than it was some years ago. It is stated that the vaccine has not only saved many animals to the breeder, but has gone far towards the eradication of blackleg. Experimental work and investigations are also being carried on in connection with the breeding of horses, cattle, sheep and poultry, also in feeding live stock, most of the work being in co-operation with State experimental stations. In the same way a great number of enquiries are being made in regard to the dairy industry. An effort has been made to improve dairying conditions in the south, by giving assistance in rebuilding barns and constructing silos, in the selection and breeding of cattle, and in the keeping of records.

One of the most important branches of the Department is the Bureau of Plant Industry, which not only endeavours to aid the farmer in protecting his crops from destructive insects and diseases, but also to improve existing varieties of plants by breeding and to introduce new crops suitable for cultivation in the United States. A prominent position in Mr. Wilson's report is given to the success which has attended the introduction of durum wheat. This was brought from Russia and Africa between 1899 and 1902, and it is now grown over an

area of 3,000,000 acres, chiefly in regions of low rainfall which were unsuitable for the growth of other wheats and in many cases for any agricultural purpose.

The present condition of the beet sugar industry is also considered to be largely due to the fostering care of the Department, and many other crops, particularly lucerne, cotton, tobacco, and fruit are being tested in different ways.

The Forestry Service now has under its control more than 150,000,000 acres of national forests, and great efforts are being made to arrange for the proper management of this forest land.

Excellent results have been obtained from the work of the Bureau of Entomology. This has been particularly the case as regards the Cotton-boll Weevil, the Gipsy Moth and the Brown-tail Moth. One line of action which has been taken with some success has been the introduction of parasites and predatory insect enemies.

Among the other sections of the Department are the Bureau of Chemistry, which undertakes the inspection of foods; the Bureau of Soils, which undertakes work relating to fertility, erosion, &c.; the Bureau of Statistics, which issues crop reports; and the Bureau of Experiment Stations, which promotes educational work.

The results of the investigations conducted by the Department are made known by means of publications, of which 1,415 were issued during the year, 596 being new and 819 reprints. The total number of copies distributed was 16,747,000, in addition to 6,439,000 copies of Farmers' Bulletins.

The Board of Agriculture and Fisheries have received, through the Foreign Office, a memorandum prepared by the

. Hungarian Ministry of Agriculture on the
Agricultural Education working and organization of Agricultural

In Hungary. Colleges in Hungary. There are two classes of institutions which provide instruction in agriculture, viz., the National Schools of Practical Agriculture and the National Agricultural Colleges.

National Schools of Practical Agriculture.—These schools, to the number of 21, are intended for the instruction of small proprietors, farm-bailiffs, foremen, &c. Practical instruction

is especially insisted on, but theoretical instruction is given, chiefly in the winter, for a limited number of hours per week; it is, however, confined to subjects which are considered absolutely necessary. The course extends over two years, and anyone over 17 years of age is admitted who has obtained an elementary certificate from a primary school, is healthy and of good moral character. The pupils are lodged and boarded at the school at an inclusive charge, including tuition, of 300 crowns (£12 10s.) a year, but there are also free scholarships.

Each of these schools has a farm of from 142 to 560 acres devoted to all branches of agriculture, horticulture and vine-growing, and the breeding of live stock. All the work of the farm is done by the pupils under the direction of the instructors, so that they are taught practically the use of the various implements and machinery, the care and management of cattle, the storage of grain and wine, as well as the manufacture of the products common in the district.

The theoretical instruction occupies from 10 to 12 hours a week, and includes 1. Grammar; 2. Land Measurement; 3. Geography; 4. Elementary physics; 5. Agriculture; 6. Live stock, dairying; 7. Book-keeping; 8. Laws relating to Agriculture; 9. Horticulture, arboriculture and vine-growing; 10. Poultry, bees, &c.; 11. Arithmetic. An examination is held at the end of each six months, and a final examination at the end of the two years, which includes an extensive test of the practical knowledge gained by the students.

A winter school for small holders who can only leave their farms for a short time is also held at these institutions. It is divided into two courses of about two months each.

Popular courses of weekly lectures extending over from two to four months are given, and addresses adapted to the local type of agriculture are given by migratory lecturers, who endeavour in particular to spread a knowledge of the laws for the encouragement of agriculture, and also to further the spread of co-operation. Agricultural courses extending over four weeks are also held for teachers in primary schools.

Agricultural Colleges.—The five Agricultural Colleges are provided with the buildings and laboratories necessary for higher agricultural instruction, together with farms of from 560 to 850 acres, so that the students can obtain both a

theoretical and practical training. The work at these colleges is not limited merely to teaching, but includes also experiments and research. Three of the colleges take a limited number of boarders at 40 crowns (33s. 4d.) a month, and this privilege is much sought after by the less well-to-do students, but the remaining students board and lodge in the neighbourhood. The charge for tuition is only about £4 a year, and scholarships are provided for students without the necessary means. Students who have passed the concluding examinations of the secondary school course are admitted for the full course, which extends over three years; but adults and students from the higher schools can attend any special courses they may wish.

Theoretical instruction is given in the morning, and the afternoon is reserved for laboratory and practical work. Excursions extending over eight to ten days are arranged in the summer for the purpose of inspecting well-known estates and factories. In the first year, 12 hours' instruction are given weekly in chemistry, physics, botany, mineralogy, geology and physiology; and three complete days in each week are devoted to work in the fields, gardens and vineyards. In addition, the students are entrusted with the supervision of various parts of the work of the farm, and are required to make written reports, and to keep a diary. In the second year, 23 hours weekly are devoted to instruction, particularly in regard to cultivation, breeding, machinery, plant-pathology, horticulture, viticulture, &c. In the third year, the instruction takes a more economic character, and includes estate management, political economy, the principles of public administration, veterinary science, forestry, &c. At the end of each school year, the students undergo an examination for admission to a higher class. Diplomas are awarded at the end of the complete course.

The Ministry has established in connection with each of the colleges a chemical experimental station, a seed station, a meteorological observatory, an experimental field for the cultivation of plants, and a botanic garden. At some of the colleges there are, in addition, stations devoted to dairying, tobacco cultivation, distillation, machinery trials, and plant-pathology. At each of the colleges, a consultative committee, composed of the officers of the college, gives advice to farmers.

The ungenial weather of March was continued during the whole of April. During the *first week* (ending the 4th April) falls of rain were very frequent, while there were occasional showers of hail in the west and south, and of sleet or snow in the northern districts. The temperature, however, differed very little from the average. With the single exception of England N.E., rainfall was "heavy" throughout Great Britain, while bright sunshine was as a rule "moderate" (England S.W., "scanty"). Strong winds and gales prevailed. During the *second week* the weather was mostly fair, especially at the beginning. Warmth was, however, normal, and so was the rainfall, except in the Midlands, England N.W. and S.W., where it was "light." Bright sunshine varied a good deal, being "scanty" in Scotland E. and England N.E., "moderate" in England E., the Midlands, Scotland W. and England N.W., and "abundant" in England S.E. and S.W. The wind was generally northerly and the season remained as backward as ever. The accumulated day degrees of temperature above 42° were much below the average for the spring, while the degrees below 42° were generally in excess. During the *third week* the weather was generally fine, with a dry atmosphere. Temperature was "deficient" everywhere in Great Britain except in the Midlands, Scotland W. and England N.W. Rainfall was "light" or "very light" (England N.E. "moderate") while sunshine varied, being "moderate" in Scotland E., England N.E., Midlands and England S.W., and "abundant" in England E. and S.E., Scotland W. and England N.W. The wind was northerly, cold and sometimes strong.

The *fourth week* witnessed weather of a character most unusual for the time of year. The general condition was very wintry and unsettled over the whole Kingdom. During the earlier days showers of hail, rain, sleet, or snow were experienced in many places, while towards its close considerable amounts of snow fell in almost all districts, the falls being especially heavy in the south of England and in the neighbourhood of Edinburgh. The temperature was everywhere "very deficient," the thermometer falling to 10 degrees at Balmoral, and on the grass at the same place to 4 degrees. Rainfall was "very heavy" in England E. and S.E., "heavy" in England N.E. and in the Midlands, elsewhere it was "moderate" (Scotland W. "light"). Except in England N.W. and S.W., where it was "moderate." Sunshine was "scanty" in England. In Scotland W. it was actually "abundant." The season by this time was even more backward than the week before, and the deficiency of accumulated day degrees was startling. The rainfall was well above the average for the spring, and in most places for the year.

Several correspondents have reported on the abnormal weather. In Berkshire it is stated that on the 23rd about three inches of snow fell; this disappeared the next day, but on the 25th snow fell for 15 hours and was about two feet deep on the level, a state of things that has never been known to occur before so late in the season. On the 28th, very heavy rain fell and the snow disappeared, but the low-lying lands were all flooded. Work on the farm was much hindered and vegetation was kept back. Trees were broken with the weight of the snow, but it was not believed that any serious injury had been caused to cattle or sheep. In North Lancashire it is said that very little progress was made during April, and pasture remained bare, so that farmers had a good deal of trouble in providing food for stock. On the other hand work on the farm proceeded almost uninterruptedly. Very little harm appears to have been done to the fruit in Berkshire. From Worcestershire the following report is sent: It is too early as yet to measure the full effect of the late hard frost and bad weather. As far as can be seen at present the effect has been much less than might have been anticipated. Gooseberries have been most hurt, especially where grown away from the protection of other fruit trees. Currants have escaped injury. The plum trees, though the blossom was covered with wet snow and frozen solid, have suffered very little damage and there is plenty of uninjured bloom left for a full crop. Other fruit trees were not sufficiently far advanced to be susceptible to frost.

Notes on the Weather and the Crops in April.

The following report has been received from *Wisbech*: It is as yet too early to make any definite statement as to the effect of the unfavourable weather towards the end of April upon the fruit crops. It appears, however, that the "top fruits" (chiefly apples, pears and plums) are not sufficiently forward to have suffered at all, while the soft fruits, raspberries (except it may be the very early varieties), black-currants and strawberries have also escaped injury.

Damage has been done to the red-currants and the crop undoubtedly has been materially reduced, while the gooseberries have also suffered. A few warm days are necessary in order to ascertain the extent of this damage, though it is not considered to be great among the gooseberries. The gooseberry crop shows signs of being the heaviest for a good many years, and some growers consider that any reduction of the crop due to late frosts would do more good than harm. In S.E. Kent it is stated that on the farm the unsettled weather has hindered cultivation and sowing, but crops have not been injured by the frost and snow. Crops look well on lighter land, though on heavy land early sown oats are said to have partially rotted on the ground. In the fruit plantation all the blossoming is late. The gooseberries exposed to the frost and snow do not appear to be any the worse for it. Near buildings gooseberry blossoms have been attacked by sparrows and chaffinches. Lambs are strong and well, and but little affected by the weather. Early sown vegetables, such as spinach, peas, parsnips, &c., are coming up very slowly.

Holland.—The Dutch Department of Agriculture issued in the *Nederlandische Staatscourant* for the 25th April, a report on the state of the crops in Holland up to the 15th April, 1908, prepared by Agricultural and Horticultural Instructors of the Department. Further reports will be made giving the same information up to the 1st June for market garden produce and to the 15th June for agricultural crops.

Notes on Crop Prospects Abroad.

cultural Instructors of the Department. Further reports will be made giving the same information up to the 1st June for market garden produce and to the 15th June for agricultural crops.

The autumn of 1907 was, on the whole, favourable, so that early sown plants began the winter under good conditions. The cold weather began about Christmas and continued with alternations of thaw, but with scarcely any snow till the beginning of February. The crops were thus exposed to trying conditions and in some places suffered terribly. Caraway and cabbages were in an unsatisfactory state and in places were ploughed up. Rye, where sown early was, on the whole, good, but many complaints were sent in as to the unsatisfactory condition of that sown later. To a certain extent this applies to other plants. Wheat sown after beans or beets exhibited an unsatisfactory appearance. Cabbages have suffered and in Zeeland more than a tenth of the land has had to be resown. Few complaints were made of losses from pests, but wheat is said to have suffered from a small grain fly and caraway from a mildew. The season was everywhere backward, and little progress was being made owing to night frosts, grass and clover having suffered most, while farmers find a difficulty in getting keep. Speaking generally the condition of things in the north is slightly better than in the south. Wheat is, on the whole, fairly good, except in North Holland where it is moderate. In Groningen it is good and Friesland very good. Barley is good, but in some places merely fairly good or moderate. Rye, sown early is good or very good, sown late rather bad or moderate. Cabbages are good in Groningen and Friesland, elsewhere not so good. Grassland is everywhere backward; clover though late is fairly good to good in the north, and moderate to fairly good in the south. Cucumbers have suffered. Fruit trees are generally very satisfactory, but in places only fairly good. In one district they are said to be excellent.

Hungary.—According to a report issued by the Ministry of Agriculture in the middle of April the condition of the winter-sown cereals in most districts satisfactory, with th

exception of winter barley which is not so good. Wheat and rye are coming up well, and also summer barley and oats.

Germany.—The report on the condition of the crops in the middle of April issued by the German Statistical Bureau, states that the autumn-sown crops have generally come through the winter satisfactorily. The weather in the spring was less favourable, the continual low temperature, cold winds and frequent night-frosts having retarded growth. Crops sown early are showing strong shoots, but, late sown kinds have suffered more or less from the weather and are rather thin. English varieties of wheat have again shown themselves less able to withstand frost than the native kinds. The condition of wheat is a little better than the average at this time of the year during the past 15 seasons.

United States.—The Crop Reporting Board of the Bureau of Statistics of the Department of Agriculture, states that the average condition of winter wheat on April 1st was 91·3 against 91·1 on 1st December, 1907, and 89·9 on 1st April, 1907. The mean of the averages for 1st April of the past ten years was 86·2.

The Board of Agriculture and Fisheries have been furnished by the Board of Trade with the following report, based on returns from over 200 correspondents in

Agricultural Labour in England during April. various districts on the demand for agricultural labour in April:—

Employment during April was generally regular until towards the end of the month, when rain and snow caused some loss of time in most districts. The supply of day labourers was generally sufficient, but a scarcity of men for permanent situations was reported from several Unions.

Northern Counties.—In *Northumberland*, *Cumberland*, and *Westmorland* wet and stormy weather interfered with outdoor work, and employment was somewhat irregular. In some districts there was a fair demand for day labourers to assist in potato planting, manure carting, &c., and the supply of this class of labour was quite adequate. A correspondent in the Hexham Union states that at the annual hirings in the first week of April higher wages were given in some instances, and that boys were scarce. Employment in *Lancashire* was fair, and day labourers were generally fully employed in sowing corn, planting mangolds and potatoes, and making the land ready for turnip-sowing. In the Fylde Union a scarcity of men for permanent situations was reported. In *Yorkshire* employment was somewhat irregular, owing to wet and stormy weather. The supply of day labourers was generally sufficient for requirements. A scarcity of men for permanent situations is reported from the Driffield and Skipton Unions.

Midland Counties.—According to correspondents in *Cheshire* and *Derbyshire*, there was a good demand generally for day labourers, but the supply was sufficient. Outdoor work was but little hindered until the end of the month, when rain, snow and frost caused some time to be lost. Employment in *Nottinghamshire* was somewhat irregular, owing to the unfavourable weather. Day labourers were in demand in some Unions, particularly for threshing. In the Southwell Union the supply of men for permanent service was reported to be insufficient. In *Leicestershire* rain and snow caused some loss of time, but employment was fairly plentiful. In the Melton Mowbray and Market Harborough Unions a scarcity of men for permanent situations was reported. In *Staffordshire* and *Shropshire* day labourers lost time owing to inclement weather, but employment was plentiful in threshing, sowing spring corn, planting potatoes, and preparing the land for cereal and root crops. The supply of

day labourers was generally adequate, and Irish labourers were said to be available in the Tamworth and Cannock Unions (Staffordshire). A scarcity of men for permanent situations was reported from certain Unions. Employment in *Worcestershire* and *Warwickshire* was affected by snow and rain in the latter part of the month, but work was plentiful, and the supply of day labourers was generally adequate. Men for permanent posts were in demand in some districts. Similar conditions prevailed in *Northamptonshire*, *Oxfordshire* and *Buckinghamshire*. Day labourers lost time in *Herefordshire* and *Bedfordshire* in consequence of wet and stormy weather. The supply of this class of labour was generally equal to the demand.

Eastern Counties.—In *Huntingdonshire* and *Cambridgeshire* some days were lost owing to wet weather, but work was plentiful in sowing spring corn, preparing land for roots, threshing corn, &c. The supply of day labourers was adequate. Employment in *Lincolnshire* was plentiful, and little time was lost. Day labourers were in demand, and the supply was not always sufficient. In *Norfolk* farm work is in arrear, and day labourers found ample employment when the weather permitted. The supply of this class of labour was generally equal to the demand. Employment in *Suffolk* and *Essex* was regular in the early part of the month, but was interrupted by stormy weather in the last week. The supply of day labourers and of men for permanent situations was generally adequate.

Southern and South Western Counties.—The supply of day labourers in *Kent* was rather in excess of the demand, and some days were lost in consequence of the unsettled weather. Employment in *Surrey* and *Sussex* was somewhat irregular, owing to rain and snow and the backward state of the crops. Day labourers were not much in demand, and the supply was generally sufficient. In *Hampshire* and *Berkshire* employment was generally regular until the last week of the month, when rain and snow hindered outdoor work. The supply of day labourers was generally equal to the demand. Similar conditions were reported with regard to *Wiltshire* and *Dorsetshire*. Employment in *Somersetshire* was hindered by frost, rain and snow, and day labourers were not in demand. In *Herefordshire* and *Gloucestershire* day labourers were occupied in sowing barley and oats, hoeing, potato planting, &c. Some time was lost in consequence of inclement weather at the end of the month. The supply of day labourers in *Devon* and *Cornwall* was generally sufficient, and employment was not generally affected by bad weather. A scarcity of men for permanent situations is reported from certain Unions.

Cases for Binding the Journal.—Cases for binding Volume XIV of this Journal (April, 1907—March 1908), can be obtained from the Board of Agriculture and Fisheries, 8, Whitehall Place, S.W. Price 1s. each, post free. The complete volume, bound in cloth with gilt lettering, can also be supplied, price 6s. 6d.

Importation of Hay into Ireland.—The Irish Department of Agriculture have revoked the Order prohibiting the landing in Ireland of hay and straw brought from Great Britain.

Official Certification of Meat Food Products exported to the United States.—In view of the requirements of the Food Laws in operation in the United States and the Philippine Islands in regard to meat foods imported into those countries, the Local Government Board, at the request of the Foreign Office, have formulated a scheme of conditions to be complied with by traders in England and Wales who prepare or pack meat foods for export to the United States and the Philippine Islands and who desire that such exportation should be accompanied by an official attestation of precautions to safeguard the wholesomeness of the foods in question. Certificates under these Regulations will be accepted by the United States Department of Agriculture in the enforcement of the provisions of the Food and Drugs Act. Firms interested can obtain a copy of the scheme from the Local Government Board, Whitehall, S.W.

Prohibition of importation of live stock from Scotland into Finland.—The Board are informed, through the Foreign Office, that an Order has been issued prohibiting until further notice the importation from Scotland into Finland of ruminating animals and pigs and animal products.

Winnipeg Industrial Exhibition.—At the Winnipeg Industrial Exhibition which will be held from July 11th to 17th, 1908, a Competition will be held for Light Agricultural Motors, and three prizes (medals) will be awarded for the best motor for general farm purposes. Entries to be made on or before June 1st. A copy of the Rules and Conditions can be seen at the Offices of the Board.

Discovery of Potash in Alsace.—The *Moniteur Officiel du Commerce* (Paris) publishes a report by the French Consul at Bremen relative to deposits of potash salts that have recently been discovered in Alsace, in a district covering nearly 200 square kilometres, extending from Soultz and Regisheim in the north, to Niedermorchnviller, near Mulhouse, in the south. A superior deposit of the salts 1 metre in thickness and an inferior deposit 5 metres in thickness have been found at a depth of from 500 to 700 metres, in beds containing rock salt. The salts discovered in the northern part of the district are estimated to contain about 43 per cent. of chloride of potash, and those from the southern part from 25 to 30 per cent. In a south-easterly direction the thickness of the deposit tends to diminish. It is stated that the first factory has already been installed in Alsace and that shafts are now being sunk. (*Board of Trade Journal*, 19th March, 1908.)

Spangle Galls eaten by Birds.—With reference to the note in this *Journal* (February, 1908, p. 686) as to wood pigeons feeding on spangle galls, the *Kew Bulletin* records the fact that a packet of "seeds" was received from Argyllshire which had been taken from the crop of a Grey-hen (the female black grouse) shot on 17th October. The crop of the bird was found to be full of these seeds and an immense number of small beetles; a few days later the crop of a Black-cock was found with similar contents. The supposed seeds, which were yellowish green and smooth, proved to be the common spangle-gall of the oak leaf (*Neuroterus lenticularis*), the characteristic hairs having been rubbed off.

OFFICIAL CIRCULARS AND NOTICES.

The Board have addressed the following Circular letter, dated the 24th April, 1908 (A 165/C), to County Councils and Councils of County Boroughs in England and Wales :—

SIR,

**Circular as to the
Small Holdings and
Allotments Acts.**

I am directed by the Board of Agriculture and Fisheries to advert to their Circular letter of the 1st January last (A 156/C),* and to enclose herewith for the information of your Council two copies of the Regulations made by the Board, with the approval of the Treasury, under Section 17 of the Small Holdings and Allotments Act, 1907, as to the repayment out of the Small Holdings Account of expenses incurred by the Council in proceedings in relation to the acquisition of land for the purposes of small holdings under that Act.

The Board do not think it advisable to attempt to indicate precisely what particular items of expense will be subject to repayment, as each application will have to be considered on its merits, but they think it may be of assistance to your Council to state that in ordinary cases the following expenses would seem to be the main items which would be repayable under the Regulations, viz. :—

* See *Journal*, January, 1908, p. 597.

1. Cost of report and valuation in respect of any land, the acquisition of which is under consideration by the Council.
2. Cost of proceedings for obtaining a compulsory order.
3. Arbitration expenses in cases of compulsory purchase.
4. Valuation expenses in cases of compulsory hiring.
5. Conveyancing expenses.
6. Cost of registration of title.

I am to add that your Council will observe that the first item mentioned above covers cases where the land under consideration is not eventually acquired.

I am, etc.,

T. H. ELLIOTT, *Secretary.*

The Board of Agriculture and Fisheries, in pursuance of Section 17 of the Small Holdings and Allotments Act, 1907, and with the approval of the Lords Commissioners of His Majesty's Treasury, hereby make the following Regulations:—

Regulations under the

Small Holdings and Allotments Act, 1907.

1. The Board will, subject to these Regulations, repay to a County Council or the Council of a County Borough the whole of the expenses which in the opinion of the Board have been necessarily or reasonably incurred by the Council in proceedings in relation to the acquisition by the Council of land for small holdings, including any allowance to any officer of the Council for work done in relation to such acquisition. [See s. 4 (4) of Small Holdings Act, 1892.]

2. An application for repayment shall be signed by the County Treasurer and countersigned by the Clerk of the Council, and shall state that an order for payment of the sums therein mentioned has been duly made by the Council on the recommendation of the Finance Committee, if any, of the Council.

3. An application shall contain, or be accompanied by, such particulars of the expenses as will enable the Board to decide as to whether they have been necessarily or reasonably incurred, and any further particulars required by the Board shall be furnished by the Council.

4. Except under circumstances which in the opinion of the Board are exceptional and with the approval of the Treasury, the Board will not repay—

(1) expenses of registration of the Council as proprietors with an absolute title ;
[See Land Transfer Act, 1897, s. 19.]

(2) expenses of litigation incurred without the previous consent of the Board, or in excess of any limit expressed in such consent.

5. No purchase money or rent, nor any compensation payable under the said Act, will be repaid by the Board to a Council under these Regulations.

6. These Regulations apply only to expenses incurred since the first day of January, nineteen hundred and eight.

In witness whereof the Board of Agriculture and Fisheries have hereunto affixed their Official Seal this eighteenth day of March, nineteen hundred and eight.

T. H. ELLIOTT,

Secretary.

Approved

JOSEPH A. PEASE,

J. HERBERT LEWIS,

Lords Commissioners of His Majesty's Treasury.



The Board have addressed the following Circular letter, dated the 27th April, 1908, to Local Authorities in Great Britain under the Diseases of Animals

Circular Letter as to Acts :—

Swine Fever. SIR,

I am directed by the Board of Agriculture and Fisheries to forward to you herewith copies of the Swine Fever Order of 1908, and of the Swine Fever (Regulation of Movement) Order of 1908, together with Memoranda explaining the differences between the new Orders and those they supersede.

The Board have for some time past been of opinion that some alteration of procedure in their operations against Swine Fever had become necessary, and have only awaited the outcome of certain experiments which have been conducted by their Veterinary Officers before deciding upon the precise course to be adopted.

It will be noted that whilst the principle of the existing Orders has been preserved in the new Orders, certain modifications of the present requirements have been made, which it is hoped will in a large measure give relief to the breeders and feeders of swine, and also to butchers, from whom representations have from time to time been received as to inconvenience and loss which in certain circumstances have been experienced by them in connection with their business.

The Swine Fever Order of 1908.—The procedure on premises on which Swine Fever has been detected has been revised so as to allow of some differentiation of treatment between diseased or suspected swine, and those which exhibit no symptoms of the disease and are not housed in sties in which disease has been detected. The movement of the latter off the premises direct to a slaughter-house will be facilitated, and in special cases of necessity movement of swine on to the premises, except into the infected part, can be authorised by a licence of an Inspector of the Board.

It is clear that the results to be expected from the operation of the new Order must depend, not only upon the provisions it actually contains, but upon the action taken under the direction of the Board as regards the isolation or the slaughter of swine in sties in which diseased pigs are or have been kept, and in this connection I am to acquaint you, for the information of your Local Authority, that, with a view to expedite the eradication of the disease from the premises, the Board contemplate ordering the slaughter, with compensation, of all breeding stock on the premises likely to be a source of danger if kept for the purpose of continuing breeding.

The Swine Fever (Regulation of Movement) Order of 1908.—This Order which, as explained in the Memorandum thereon, supersedes the Swine Fever (Infected Areas) Order of 1902 and the Swine Fever (Regulation of Movement) Order of 1903, has been drawn with the two-fold object of harmonising the procedure under those two Orders, and of simplifying, as far as possible, the conditions attaching to the movement of swine for slaughter.

In Part II. the main provisions of the Swine Fever (Infected Areas) Order are embodied with certain modifications. It is believed that the adoption of this course will be attended by considerable advantage from the point of view not only of the Board but of Local Authorities with whom the administration of the Order rests. The forms of licence and declaration are applicable, not only to movement from one scheduled area to another, but also to movement into, out of, or within an Infected Area, and the fact that these forms will be ready at hand will obviate the necessity for allowing so long an interval of time to elapse before bringing the more stringent movement restrictions into effect when occasion arises. Such inconvenience and complication as sometimes arise, owing to the differing requirements of the existing Orders, will be avoided, and a reduction in the expense entailed on Local Authorities where an Infected Area is made will be secured.

The modifications embodied in the new Orders, especially those in respect of

movement for slaughter and breeding, have not been adopted by the Board without some hesitation, and in their opinion they are likely to be a source of danger unless extreme vigilance and caution are observed by the Local Authorities in their administration. It is also of essential importance that the hearty co-operation of the general public should be enlisted. The Board feel, however, that they may rely on every effort being made by Local Authorities to secure the due observance of the Orders, and they believe that if the public give their support the substantial measure of relief thus afforded will not prejudice the general position as regards the prospect of the reduction of Swine Fever.

The Board desire me to add that the publication of these Orders may be limited to the provisions of the Orders and that the Forms need not be published.

I am, &c.,

T. H. ELLIOTT, *Secretary.*

The principal alterations in procedure to be effected by the Swine Fever Order of 1908 are the following :—

**Memorandum as to
the Swine Fever Order
of 1908.**

(1.) The Notice (Form A.), declaring an "Infected Place" subject to the Rules contained in Article 3, is as far as practicable to include only the sty, shed, or other inclosure in which a diseased or suspected pig is or recently has been, but the movement of swine into or out of any other adjoining premises in the same occupation becomes automatically subject to the Rules contained in Article 5. Thus in the case of an outbreak on a farm the "Infected Place" will generally be limited to one or more sties or sheds, and the movement of swine not affected with or suspected of swine fever into or, if for slaughter, out of the remainder of the premises will no longer be prohibited, but such movement is placed under restrictions requiring a licence granted by an Inspector of the Board [Article 2 (3)].

(2.) The carcase of a pig intended to be used for the food of man, may, after being scalded and dressed for that purpose, be removed from an Infected Place without a permit or licence, but the Inspector of the Local Authority is to be notified of such removal [Article 3 (2)]. The stomachs and intestines are excepted, and also the carcases of diseased or suspected swine.

(3.) Where, as a precautionary measure, premises have under Article 4 been placed under restrictions by service of a Notice (Form B.), the Inspector of the Local Authority is empowered to authorise by licence the movement of swine out of the premises to a bacon factory or slaughterhouse, and also to authorise the movement of swine on to the premises in accordance with Rule 4 in Article 5.

(4.) The provisions of the Swine Fever Order of 1894 and the Swine Fever Order of 1901 as to cleansing and disinfection are reproduced with some modifications, and a uniform mode of cleansing and disinfection is prescribed by Article 13.

(5.) Destruction by the Local Authority of diseased and suspected carcases by burning on the place of outbreak is permitted by Article 6.

(6.) Article 15 empowers Local Authorities to make Regulations with a view to securing the Inspection or examination of swine entering any market, &c.

(7.) Article 16 empowers Local Authorities to make Regulations as to the keeping of Registers by pig-dealers and owners of boars.

(8.) Article 19 extends the existing powers of Inspectors of Local Authorities as regards seizure where diseased swine are found in markets, saleyards, &c., to cases where suspected swine are found.

(9.) Special attention is called to Article 21 of the Order, which provides for Monthly Returns of swine remaining on premises subject to Notice (Form A.).

(10.) Local Authorities are no longer authorised to make Regulations as to movement into or within their Districts, but existing Regulations remain in force until they are revoked.

(11.) The Swine Fever Order of 1894 (No. 5193) and the Swine Fever Order of 1901 (No. 6339) are revoked.

1. This Order supersedes the Swine-Fever (Infected Areas) Order of 1902 and the Swine-Fever (Regulation of Movement) Order of 1903, and combines in one Order the restrictions on movement to take effect in the existing "Scheduled Areas," and also the further restrictions applicable to those parts of the Scheduled Areas which are declared to be Infected Areas. Except in these Infected Areas, Part II. of the Order will not apply.

Memorandum as to Swine-Fever (Regula- tion of Movement)

Order of 1908.

of fat swine;

(b) Modification of the restrictions on movement connected with the movement of swine for breeding;

(c) Simplification of procedure, particularly as regards movement, between Scheduled Areas and Infected Areas.

In view of these modifications, it has been thought desirable to limit the movement of store swine into a Scheduled Area to swine which have been on the premises for a continuous period of twenty-eight days immediately preceding the date of the proposed movement, and which have not during such period been in contact with any pig that has been moved on to those premises within such period.

3. The forms of Declarations and Licences are made applicable to movements under either Part I. or Part II. of the Order.

4. Copies of Licences issued under Part II. are not required to be sent to the Board, as at present under the Swine-Fever (Infected Areas) Order.

5. The existing procedure as to specially authorised lairs, markets, and saleyards for swine intended for slaughter is extended to Infected Areas.

6. Article 15 makes special provision for movement of swine (not in Infected Areas) to and from exhibitions licensed by the Local Authority.

7. Facilities are given by Article 7 for movement of swine to railway stations which are within an adjoining Scheduled or Infected Area for transit to some place outside that Area.

8. A Table of various movements regulated by Parts I. and II. of this Order is attached* illustrating the procedure and the Forms of Declaration and Licence required.

9. Further copies of this Memorandum will be supplied for the use of Officers of Local Authorities on application.

The principal provisions of this Order, which is dated the 9th of April, 1908, may be summarised as follows :—

Sheep Dipping (England) Order of 1908.

31st May are accepted as a compliance with the Order [Art. 3 (3) (iv)]. These conditions are (1) that the sheep be dipped according to the method prescribed by the Order; (2) that notice of dipping be given to enable the Inspector of the Local Authority to attend; (3) that after dipping the sheep be kept from contact with undipped sheep, and a Return (Form B) be made of the dipping. In order to give effect to these provisions it is necessary that Local Authorities should make the appointments required by Art. 7, and set up the machinery of the Order by the 1st June.

1. The Dipping Area remains as in 1907, with the addition of the Petty Sessional Division of Overton, a detached part of the County of Flint.

2. The Dipping Period commences 15th July and ends 31st August. [Art. 3 (1)]. Dippings carried out in the Dipping Area under certain conditions after the

* Not printed.

3. The provisions for notice of intention to dip remain unaltered. (Art. 4.)
 4. On and after 15th July all sheep entering or exposed for sale in a market, &c., are required to have been previously dipped [Art. 14(1)]. A provision has been made [Art. 14 (2)] to facilitate the collection of the declarations accompanying sheep, and the issue of declarations in the Form G to the buyers or owners of the sheep, which will enable them to take these sheep without difficulty to a subsequent market or sale. The plan has been tried and found useful in Scotland. In some cases it will probably be found desirable for the Local Authority to appoint persons specially for this purpose.

5. Movement into the area during the prescribed dipping period is governed by Arts. 15-20:—

(a.) Dipped sheep may be moved into the area under Art. 16 if they have been dipped in the presence of an Inspector within 28 days of the movement, and since the dipping have been kept isolated from undipped sheep and not exposed in market, fairground, or saleyard. The sheep must be accompanied by a declaration made in the Form H, a copy of which must be sent to the Inspector of the Local Authority of the district from which the sheep are to be moved before the movement takes place, and be by him transmitted to the Local Authority of the district into which the sheep are to be moved. [Art. 16 (2)].

(b.) Undipped sheep may be moved into the area under Art. 17 by licence, a copy of which is to be sent to the receiving Local Authority. Sheep so moved must be kept separate from dipped sheep on arrival, and are subject to detention on the place named in the licence till they have been dipped. This provision does not authorise movement to a market, fairground, or saleyard.

(c.) Sheep for immediate slaughter may be moved without previous dipping into the area under Art. 18 if marked with a red cross and taken direct to a slaughterhouse, where they must be detained till slaughtered.

6. Special provisions for lambs for immediate slaughter are contained in Art. 19 (1) (2); and for markets for store lamb, which have not been dipped, in Art. 19 (3).

7. Sheep for exhibition may be admitted from outside the area on licences granted by the Local Authority under Art. 20.

8. Regulations made by Local Authorities in the exercise of their powers under Art. 9 of the Sheep Scab Order of 1905 are suspended during the Dipping Period.

The Board have issued the following Circular to Local Authorities in Great Britain:—

SIR,

17th March, 1908.

**Circular as to Names
for Mixtures of Butter
and Milk or Cream.**

I am directed by the Board of Agriculture and Fisheries to inform you that the following names have been approved by them under sec. 9 (1) of the Butter and Margarine Act, 1907, for mixtures of butter and milk or cream:—Bradlac, Brenco, Casa, Casana, Casmon, Casoa, Casora, Casova, Consumo, Fromaid, Iveldale, Iveldene, Ivelate, Ivelene, Ivellette, Ivelike, Ivelmene, Ivelmore, Jensa, Kingstyle, Pearks' Breadmate, Pearks' Bredspred, and Pearksown.

I am also directed to ask you to be good enough to notify the Board (if this has not already been done) of the registration of any premises which have been registered with your Local Authority as butter factories, or premises on which mixtures of butter and milk are manufactured, or on which such mixtures are dealt in wholesale.

I shall be glad to forward to you additional copies of this circular on application.

I am, &c.,

T. H. ELLIOTT, *Secretary.*

REVIEW OF MARKET PRICES IN APRIL.

A. T. MATTHEWS.

The month began with accounts from nearly all the country markets of a good demand for fat cattle with prices showing a tendency to advance. Quotations, however, rarely exceeded 6½d. to 7d. for nice cattle of handy weights. There had been a visible improvement in the tone at London on March 30th which was more than maintained on April 6th in the face of a larger supply. Much business was done before 5 a.m. and buyers were seen who have forsaken Islington for a long time past. The falling off in American shipments had considerable effect, together with sensational statements of huge re-exportations of tinned beef. It was further reported that in the English shires there were very light reserves of feeding beasts in the stalls, in view of the fact that fully three months must pass before grass-fed animals could be available. At Norwich on April 4th no fewer than 1,383 head of fat cattle were on offer, but these were nearly all taken by buyers from distant centres. The most striking feature was the activity of buyers for the Central Meat Market both at Norwich and London.

Both in London and country markets the very dull demand for mutton which has so strongly marked the present year was continued during the first week of the month, but the seeming reluctance to buy did not result in any appreciable lowering of prices. For several weeks the top price of first quality Down tegs had stood firm at 9d. per lb., and this was again the case at Islington on the 6th. Clipped sheep were fairly numerous, but were all cleared off by eleven o'clock at prices varying from 7d. to 8d. per lb. according to weight and quality, and as clipping becomes general a more lively trade was freely foretold. The weather continuing cold lambs were in poor request, and prices still ranged from 13d. to 9d. per lb.

In the dead-meat market trade was quiet, but prices were firm, and a small but distinct advance was established for all the best classes of beef, while mutton was certainly no cheaper. Pork and veal showed very little change, but there was less depression in the trade for the former than in the closing days of March.

The second week of April saw a continuance of the improvement in the beef trade in the large provincial markets, but at Islington on the 13th there was a decided check. This market is very sensitive to adverse reports through being so closely in touch with the dead-meat trade, and the rumour of heavy arrivals from Denmark was quite sufficient to cause a temporary restriction in the demand. Prices in consequence fell to the extent of about 15s. per head, a movement which was accentuated by a moderate increase in the supply. The London sheep market was better supplied than of late, chiefly owing to its being the great week for Easter lambs. This section proved disappointing to sellers, notwithstanding that the total number of lambs on offer was far smaller than usual for this great occasion. Prices were lower by nearly 2d. per lb. than at the corresponding market last year, although the supply was then larger. This depression was attributed entirely to the coldness of the weather, a continued low temperature always affecting the demand for both lamb and veal. The highest price quotable was 11½d. per lb. and a large proportion were sold at 9½d. In the provincial markets the supply of fat lambs was larger than last year, owing chiefly to Easter falling rather late, and prices showed a slight fall. About half the fat sheep were clipped, and these met a quiet trade at fair rates, 8½d. per lb. being occasionally given for small choice Downs. Veal calves were rather a poor supply, and trade not very encouraging.

The dullness in the beef trade at Islington was not justified by subsequent events at the Central Market, for all the better classes sold well in view of Easter. Prime Scotch long sides fetched 59s. 6d. per cwt. and short sides 64s. 2d., while English made 54s. 10d., and best port killed reached 57s. 2d., the highest prices for many months. More noteworthy still was the value of United States chilled hind quarters, which advanced to 63s., and fore quarters to 43s. 2d. Whether really justified or otherwise there was a distinct feeling of confidence in the trade for beef, which did not extend to other meat. Mutton was slow to sell, and English gave way to the extent of ½d. per lb. Pork showed no improvement. Provisions again fluctuated, there being a considerable fall in continental butters, though colonial appeared to have touched bottom for a time. Bacon

was advancing, and factors were predicting a much better trade for the summer.

Third Week.—The weather is always a very important factor in all branches of the meat trade whether alive or dead, and in many ways that which preceded and followed Easter this year will be long remembered, not only for its discomforts and the delay of vegetation in an already very backward season, but also for its disturbing effect on the stock markets. There is little doubt that with the single exception of beef all branches of the trade have suffered from the unseasonable spell of wintry weather. Islington market on Bank holiday was held as usual, and was again much oversupplied for such an occasion. Senders would do well to note that the usual buyers absent themselves from business, on a general holiday, to a far greater extent in London than in the country markets, and it is certain that half the number of cattle and sheep exposed on Easter Monday would have been ample for all requirements. Fortunately for their clients, the salesmen, knowing the situation, held firmly to the fine quality cattle on offer, and preferred to keep them over rather than sell at a reduction, so that the values of the preceding week were maintained at $6\frac{3}{4}d.$ per lb. as the top price. It was very different in the sheep market, where there was great anxiety to sell, especially the clipped tegs, of which there were about 2,000. These were heavily handicapped by the cold northerly wind which was blowing with occasional heavy snowstorms, suggestive of "chilled" carcasses and consequent loss to buyers. The result was a nominal fall of $\frac{1}{4}d.$ per lb. on the clipped sheep, while larger concessions were really made to force sales. The highest price of small Down tegs (clipped) was 5s. $4d.$ per 8 lb., but those in the wool were much more firmly held, and maintained former quotations up to 6s. as the top figure, clearly showing that much of the depression arose from atmospheric causes. Lambs were somewhat more easily disposed of at 10d. to $11\frac{1}{2}d.$ per lb.

Allowing for its being holiday week the trade for good beef cattle was very satisfactory in the country markets. At not a few some advance was made, Darlington reporting the best market since Christmas. In the rare cases where a slight decline was recorded, the fall was attributed to the holidays.

Most of the markets were dull for sheep, especially for clipped sheep, and the majority were rather lower in price, while scarcely one claimed any improvement. At several places both fat lambs and calves sold better than in London, the former fetching up to 13d. per lb. It is long since London has experienced such a poor demand for veal at Easter. Bacon pigs and porkers were a very irregular trade, but the tendency for the latter was downwards. Still, a few markets were poorly supplied, and prices were a trifle better in consequence.

The dead-meat market at Smithfield ruled very firm for beef, but considerable difference was observable in the demand for the various classes. Scotch and English were fully as dear as before Easter, but Birkenhead and Deptford killed showed a moderate decline. There has been a rather curious movement of late amongst the regular buyers of port-killed beef. Without attempting to account for it I may say that there has been a strong tendency during the last two or three weeks to prefer English bred and fed animals, when well-finished, to those imported alive; and this supports the argument, often forced on the writer in certain quarters, that British farmers would withstand the competition of the foreigner better if they would pay more attention to the skilful finishing of their cattle before marketing.

The exceptionally high value of chilled beef from the States and Argentina was perhaps the leading feature of the middle weeks of April, the moderate supplies of which have strengthened the whole trade in every branch. Best American hind quarters have touched 4s. 7d. per 8 lb. and fore quarters 3s. 1d. When it is recalled that in December last these prices were 3s. 8d. and 2s. 6d. respectively, much of the general firmness of the meat trade is explained. Mutton was a very quiet trade all the week. Even small Scotch tegs which for weeks together have been fetching fancy prices, receded 1d. per lb. from the highest quoted figure, viz.:—6s. per 8 lb. The exceptional value of these small carcasses (no heavier than average New Zealand lamb) has been a puzzle to some country readers, who fail to understand why there should be 1d. per lb. difference in value between the carcase of a prime English Down teg weighing about 72 lb. and that of a Scotch weighing 48 lb. The fact is that there is a limited but very insistent demand for these small joints in the

West End clubs and certain first class restaurants, with whom it is a question of size rather than quality or flavour.

The provision trade during the week was quiet, as usual in holiday time, but prices were firm all round. Those for butter advanced in some cases, from 1s. to 3s. per cwt. for continental, but colonial was unchanged. Quantities in sight from all importing countries were very moderate and decreasing, giving a confident feeling to the trade. Cheese remained firm and bacon, especially Irish and Danish, established a decided advance.

Latest Markets.—There was a very good demand for fat cattle at Norwich on the 25th, followed by a good trade at Islington on the 27th, with an early clearance of the 860 on offer. Here the price advanced to 7d. per lb. for all well-finished Norfolks, and if we may judge by weighbridge results, this figure was occasionally exceeded. Certainly some few of those weighed after sale were shown to have realized 40s. per live cwt. On the other hand many useful bullocks were sold at 6½d. per lb., but a large proportion of the supply came from the Norfolk yards, and all these were admirably finished, and chiefly of those medium weights so highly appreciated by the butchers. The mutton trade on the same day presented a sharp contrast to that for beef. The supply was very good, the majority being in the wool on account of the weather, but the demand was lifeless, and all could not be sold even at a reduction of ¼d. per lb. The very finest small Down tegs in the wool did not exceed 8½d. per lb., the lowest price quoted at Islington for unshorn sheep of this class for some years. The same quality of clipped tegs were, at the same time, selling at 8d., which was only allowing 4s. 3d. for the fleece. A few pens of very choice Cheviots in the wool fetched no more than the English Downs. Fat lambs were slightly firmer, but none realised more than 11d. per lb.

On the morning of the 29th there was a great change in the weather and a much higher temperature. This was immediately felt in the dead-meat market, where a decided check occurred in the demand for beef. The prices of the previous week had drawn a better supply than usual from Scotland and Norfolk, but the reduction conceded for this class of meat was, if any, scarcely quotable. Port-killed fell about a penny per 8 lb., and American chilled, 3d. Chilled beef is very susceptible to

sudden changes of temperature, hence the rather heavy relative fall in its value on what may be called the first day of genial spring weather. Frozen, or "hard" beef, as it is called in the market, was held with more confidence, and no reduction was made in the price. The following is a fair scale of values in carcase beef at Smithfield at the close of the month; taking the first quality in each case:—Scotch sides, $6\frac{3}{4}d.$; English, $5\frac{3}{4}d.$; port-killed, $5\frac{3}{4}d.$; American chilled, $5\frac{1}{2}d.$; Argentine chilled, $4\frac{1}{2}d.$; New Zealand frozen, $3\frac{5}{8}d.$; Argentine frozen, $3\frac{1}{2}d.$ per lb.

Mutton was slow to sell, but prices were fairly maintained. Best small Scotch tegs weighing about 50 lb. were worth $8\frac{1}{2}d.$; Scotch weighing 72 lb., $7\frac{1}{2}d.$; prime English tegs of 72 lb., $7\frac{1}{2}d.$; best New Zealand frozen, $4\frac{3}{4}d.$; Argentine and Australian, $3\frac{3}{4}d.$ per lb.

There was no further change in the prices of provisions at the close of the month worthy of notice.

Store Stock.—If fat stock markets are influenced by the weather, those for stores are much more seriously affected. April is always a critical time for the store trade, and this year the climatic conditions could scarcely have been worse. Pastures are rather late, and the fact that prices have given way to such a small extent denotes much confidence on the part of graziers, and also tends to show a scarcity of good stores suitable for grazing purposes. Cattle are much easier of sale than sheep. With them, the weather is the ruling factor to a much greater extent than with cattle at this time of year, and it would amount to rashness to purchase largely till the prospects of summer keep are improved. A very few days, however, may accomplish wonders in this direction.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND
in the Month of April, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—				
Cattle :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Polled Scots ...	8 0	7 6	38 2	35 1
Herefords ...	8 2	7 7	—	—
Shorthorns ...	8 0	7 4	37 2	34 5
Devons ...	8 2	7 7	—	—
Veal Calves ...	per lb.* d.	per lb.* d.	per lb.* d.	per lb.* d.
	9	8	8½	6½
Sheep :—				
Downs ...	8½	8	—	—
Longwools ...	8	7½	—	—
Cheviots ...	9½	8½	• 9½	8
Blackfaced ...	9½	8½	8½	7½
Cross-breds ...	8½	7½	9½	8½
Pigs :—	per stone.*	per stone.*	per stone.*	per stone.*
Bacon Pigs ...	s. d.	s. d.	s. d.	s. d.
Porkers ...	6 1	5 8	6 1	5 6
	6 6	6 1	6 6	5 11
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	21 3	18 1	22 7	17 18
" —Calvers ..	20 19	17 14	20 3	17 9
Other Breeds—In Milk ..	18 1	14 13	18 11	15 4
" —Calvers ...	15 0	13 7	19 11	15 18
Calves for Rearing ...	2 4	1 15	2 16	1 16
Store Cattle :—				
Shorthorns—Yearlings ...	10 7	8 16	10 4	8 7
" —Two-year-olds ...	14 8	12 16	15 12	13 6
" —Three-year-olds ...	16 18	15 3	17 10	14 13
Polled Scots—Two-year-olds	—	—	16 1	14 15
Herefords—"	15 7	14 5	—	—
Devons—" ...	14 11	13 5	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs, and Lambs—				
Downs or Longwools ...	47 9	42 11	—	—
Scotch Cross-breds ...	—	—	37 5	31 11
Store Pigs :—				
Under 4 months ...	22 2	17 0	21 8	17 6

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of April, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birming-	Man-	Liver-	Glas-	Edin-
			ham.	chester.	pool.	gow.	burgh.
per cwt.							
BEEF :—							
English ...	1st	54 0	55 6	56 0	—	57 0*	54 0*
	2nd	52 6	50 6	52 6	—	55 0*	49 6*
Cow and Bull ...	1st	41 6	48 0	48 6	45 6	46 6	45 6
	2nd	36 6	43 6	43 0	41 0	38 6	38 0
U.S.A. and Cana- dian :—							
Port Killed ...	1st	56 0	54 0	53 6	53 6	54 6	—
	2nd	52 6	49 0	51 6	50 0	53 6	—
Argentine Frozen—							
Hind Quarters ...	1st	36 0	36 6	35 0	35 0	36 0	37 0
Fore ,,,	1st	30 0	30 6	30 0	29 6	30 6	30 6
Argentine Chilled—							
Hind Quarters ...	1st	49 0	48 6	47 0	46 0	51 6	49 0
Fore ,,,	1st	35 6	35 6	34 6	34 6	37 6	32 0
American Chilled—							
Hind Quarters ...	1st	61 0	60 0	60 0	59 6	60 0	61 6
Fore ,,,	1st	42 0	42 6	42 0	42 0	43 6	44 6
VEAL :—							
British ...	1st	68 0	71 0	76 6	80 0	—	—
	2nd	63 6	59 6	69 0	74 6	—	—
Foreign ...	1st	69 6	—	66 6	69 0	—	65 0
MUTTON :—							
Scotch ...	1st	78 0	—	85 0	85 0	75 0	71 0
	2nd	70 6	—	79 6	80 0	69 0	62 0
English ...	1st	72 0	70 6	79 6	79 6	—	—
	2nd	63 6	59 0	72 0	72 6	—	—
U.S.A. and Cana- dian :—							
Port killed ...	1st	—	—	—	—	—	—
Argentine Frozen ...	1st	35 0	37 0	36 0	36 0	35 6	36 6
Australian ,,,	1st	35 0	35 0	35 0	35 0	35 6	—
New Zealand ,,,	1st	44 0	41 6	—	—	—	—
LAMB :—							
British ...	1st	106 6	—	108 6	102 6	128 6	—
	2nd	99 0	96 0	98 0	93 6	—	—
New Zealand ...	1st	54 0	56 6	54 0	54 0	59 6	57 6
Australian ...	1st	46 0	48 6	44 0	43 6	46 6	—
Argentine ...	1st	42 0	48 0	46 6	45 6	—	49 6
PORK :—							
British ...	1st	55 6	59 6	57 6	56 6	53 0	52 6
	2nd	51 0	52 0	52 6	52 0	49 0	44 6
Foreign ...	1st	55 0	56 6	55 0	55 0	—	—

Scotch.

AVERAGE PRICES of British Corn per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act 1882, in each Week in 1906, 1907 and 1908.

Weeks ended (in 1908).	Wheat.			Barley.			Oats.		
	1906.	1907.	1908.	1906.	1907.	1908.	1906.	1907.	1908.
Jan. 4	28 4	26 0	35 1	24 6	23 11	26 9	18 2	17 3	18 4
" 11	28 6	26 1	35 2	24 8	24 2	26 9	18 4	17 4	18 3
" 18	28 5	26 1	35 5	24 11	24 1	27 1	18 4	17 5	18 5
" 25	28 7	26 2	35 6	25 1	24 5	26 11	18 7	17 5	18 5
Feb. 1	28 10	26 3	35 0	25 1	24 4	26 11	18 10	17 5	18 4
" 8	28 10	26 6	34 3	25 3	24 5	26 9	18 10	17 7	18 3
" 15	28 11	26 7	33 1	25 6	24 1	26 9	19 0	17 7	18 0
" 22	28 10	26 10	32 6	25 4	24 2	26 5	19 0	17 9	17 11
" 29	28 8	26 9	30 11	25 0	24 2	26 3	19 0	17 9	17 8
Mar. 7	28 5	26 8	30 5	25 1	23 11	26 1	18 8	17 11	17 8
" 14	28 5	26 10	31 3	24 8	24 2	26 0	18 10	18 0	17 10
" 21	28 4	26 10	31 7	24 4	24 0	26 2	18 8	18 1	17 11
" 28	28 3	26 8	31 4	24 5	23 9	25 10	18 11	18 2	17 10
Apl. 4	28 7	26 9	31 3	24 2	24 3	25 5	18 11	18 3	17 9
" 11	28 11	26 8	31 2	24 4	23 9	25 10	19 4	18 6	17 7
" 18	29 4	26 8	30 11	24 0	23 3	26 1	19 1	17 7	17 7
" 25	29 6	26 10	30 10	24 0	23 3	25 5	19 6	18 7	17 9
May 2	29 10	27 0	31 6	23 10	23 6	25 8	19 9	19 3	18 0
" 9	30 1	27 6	24 1	24 0			20 0	19 7	
" 16	30 3	28 4	23 10	23 10			20 1	20 1	
" 23	30 4	29 7	24 2	24 3			20 2	20 5	
" 30	30 4	31 4	22 10	24 0			20 5	20 8	
June 6	30 3	32 0	23 4	24 7			19 11	20 7	
" 13	30 4	31 10	23 6	24 7			20 2	20 11	
" 20	30 5	31 4	22 10	24 11			20 2	20 9	
" 27	30 3	31 2	24 3	24 6			20 1	20 8	
July 4	30 2	31 3	23 0	24 8			20 2	20 11	
" 11	30 5	32 0	23 8	24 10			20 4	20 11	
" 18	30 3	32 6	23 2	24 6			20 5	21 1	
" 25	30 5	32 11	22 4	27 3			20 2	20 8	
Aug. 1	30 9	33 2	22 1	26 4			19 3	21 2	
" 8	30 5	33 5	23 0	26 6			17 11	21 3	
" 15	29 0	33 6	24 2	25 9			17 0	20 4	
" 22	27 9	33 7	25 0	25 0			16 10	19 8	
" 29	26 9	33 10	24 3	24 6			16 6	18 11	
Sept. 5	26 4	31 11	24 9	24 2			16 3	17 7	
" 12	25 11	31 4	24 3	24 4			16 1	17 6	
" 19	25 9	31 5	24 3	25 0			16 0	17 6	
" 26	25 9	31 8	24 8	25 3			16 2	17 8	
Oct. 3	26 1	32 6	25 0	25 5			16 3	17 9	
" 10	26 3	33 3	25 3	25 9			16 7	17 11	
" 17	26 6	34 4	24 10	26 3			16 8	18 0	
" 24	26 7	35 9	24 10	27 2			16 10	18 7	
" 31	26 7	36 3	24 8	27 7			16 11	18 10	
Nov. 7	26 6	35 10	24 8	27 8			17 1	18 10	
" 14	26 4	35 1	24 4	27 8			17 2	18 8	
" 21	26 3	34 7	24 1	27 5			17 3	18 9	
" 28	26 1	34 7	24 1	27 5			17 2	18 7	
Dec. 5	26 1	34 7	24 1	27 1			17 4	18 6	
" 12	26 1	34 8	23 11	27 0			17 3	18 5	
" 19	26 3	34 9	24 3	27 1			17 3	18 3	
" 26	26 0	34 6	24 1	26 10			17 3	18 0	

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates: Wheat, 60 lbs.; Barley, 50 lbs.; Oats, 39 lbs. per Imperial Bushel.

AVERAGE PRICES of Wheat, Barley, and Oats per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

	WHEAT.		BARLEY.		OATS.	
	1907.	1908.	1907.	1908.	1907.	1908.
France :			s. d.	s. d.	s. d.	s. d.
February ...	39 7	39 3	26 7	25 11	22 11	20 3
March ...	40 0	39 0	26 8	25 11	22 11	19 11
Paris :						
February ...	40 2	39 4	26 10	26 2	22 8	19 8
March ...	40 0	38 5	27 3	26 2	23 0	19 6
Belgium :						
January ...	28 9	34 7	25 0	26 7	19 5	21 5
February ...	28 5	34 5	25 3	26 4	20 0	20 10
Germany :						
March ...	39 3	44 5	28 7	29 1	24 5	22 4
April ...	40 4	44 4	29 3	28 6	24 11	21 10
Berlin :						
February ...	39 8	45 5	—	—	24 6	23 0
March ...	40 5	44 7	—	—	24 11	22 6
Breslau :						
February ...	36 11	44 7	{ (brewing)	{ (brewing)	{ 22 1	{ 20 11
			22 10	27 9		
			(other)	(other)		
			29 0	29 4		
March ...	36 6	43 7	{ (brewing)	{ (brewing)	{ 22 6	{ 20 5
			23 5	27 9		
			(other)	(other)		

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets. The mark is now taken as equal to 11 8d., and the German prices for the former year have been recalculated on this basis.

AVERAGE PRICES of British Wheat, Barley, and Oats at certain Markets during the Month of April, 1907 and 1908.

	WHEAT.		BARLEY.		OATS.	
	1907.	1908.	1907.	1908.	1907.	1908.
London... ...	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
... ...	27 6	31 9	23 11	26 2	19 4	18 8
Norwich	26 4	31 8	24 0	25 11	18 3	17 6
Peterborough	25 11	30 5	22 4	25 7	17 11	17 2
Lincoln... ...	26 5	30 5	22 5	24 10	18 6	17 4
Doncaster	26 4	29 6	23 7	26 1	18 8	17 9
Salisbury	26 10	31 0	22 9	26 1	18 3	16 10

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of April, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Bristol.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
BUTTER :—	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
British	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
...	13 6	12 0	14 0	13 0	—	—	14 0	—
Irish Creamery	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
" Factory	110 6	109 0	114 0	112 0	109 6	106 6	109 0	—
Danish	105 0	100 6	—	—	104 0	98 6	—	—
Russian	108 0	105 6	112 0	110 0	107 0	104 6	107 0	100 0
Australian	108 0	104 6	110 6	102 0	108 0	105 0	109 0	—
New Zealand	112 0	110 0	114 0	112 0	112 6	110 6	111 6	—
CHEESE :—								
British—								
Cheddar	75 6	72 6	74 0	64 0	74 0	70 0	61 6	59 6
Cheshire	—	—	—	—	120 lb.	120 lb.	—	—
Canadian	66 0	65 0	64 0	62 0	63 6	62 0	65 0	63 0
BACON :—								
Irish	61 6	56 0	—	—	62 6	55 6	61 0	58 0
Canadian	51 0	47 6	51 0	47 0	50 0	46 6	52 0	50 0
HAMS :—								
Cumberland	93 0	83 0	—	—	—	—	—	—
Irish	91 6	80 0	—	—	—	—	82 0	72 0
American (long cut)	49 0	47 0	47 0	43 0	47 6	44 6	49 0	47 0
Eggs :—	per 120.	per 120.						
British	9 2	8 4	7 11	—	—	—	—	—
Irish	8 7	8 0	7 10	7 2	7 10	7 1	8 3	6 8
Danish	8 11	7 11	—	—	8 0	—	8 6	7 2
POTATOES :—	per ton.	per ton.						
Langworthy	116 0	103 0	114 0	100 0	108 6	100 0	88 0	83 0
Main Crop	111 0	100 0	112 0	102 0	108 6	100 0	—	—
Up-to-Date	111 0	97 0	113 6	95 0	93 6	86 6	82 0	75 6
HAY :—								
Clover	94 6	83 6	75 0	—	92 0	65 0	77 0	72 0
Meadow	78 0	61 0	67 6	—	—	—	55 0	52 0

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	APRIL.		4 MONTHS ENDED APRIL.	
	1908.	1907.	1908.	1907.
Swine-Fever :—				
Outbreaks	157	200	555	675
Swine Slaughtered as diseased or exposed to infection ...	1,015	1,001	2,921	3,471
Anthrax :—				
Outbreaks	90	115	407	370
Animals attacked	130	182	566	509
Foot-and-Mouth Disease :—				
Outbreaks	—	—	3	—
Animals attacked	—	—	112	—
Glanders (including Farcy) :—				
Outbreaks	56	72	266	314
Animals attacked	206	160	917	712
Sheep-Scab :—				
Outbreaks	35	31	606	376

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	APRIL.		4 MONTHS ENDED APRIL.	
	1908.	1907.	1908.	1907.
Swine-Fever :—				
Outbreaks	23	7	63	48
Swine Slaughtered as diseased or exposed to infection ...	253	158	1,206	892
Anthrax :—				
Outbreaks	—	1	3	1
Animals attacked	—	3	6	3
Glanders (including Farcy) :—				
Outbreaks	—	—	—	—
Animals attacked	—	—	—	—
Sheep-Scab :—				
Outbreaks	25	17	245	147

SELECTED CONTENTS OF PERIODICALS.

Journal of the Royal Agricultural Society of England, 1907, Vol. 68.

The Agricultural Holdings Act, 1906, *A. P. Foley*; Wild Birds, Useful and Injurious, *C. F. Archibald*; Injurious Fodder and Poisonous Plants, *Hans Th. Gussow*; The Breeding and Feeding of Pigs, *W. Wilson*; Pigs and Bacon, *John M. Harris*; Mangolds Running to Seed, *A. D. Hall*; The Lincoln Show, 1907, *T. McRow*; The Trials of Swath Turners and Side Delivery Rakes at Lincoln, 1907, *Sir Francis E. Walker, Bart.*: Report on the Farm Prize Competitions, 1907, *W. H. Hogg*; Annual Reports, for 1907, of the Principal of the Royal Veterinary College, the Consulting Chemist, the Consulting Botanist, and the Zoologist; The Woburn Experimental Station of the Royal Agricultural Society, *Dr. J. A. Voelker*.

Journal of the British Dairy Farmers' Association, XXII.

Caerphilly Cheese in Somerset, *J. H. Burton*; What is possible in the Sale of Milk and Cream, *Jas. Long*; Rearing of Spring Chickens, *S. C. Sharpe*: The Kent and Sussex Dairy Conference: A complete record of the Proceedings including a Paper on "Dairying in relation to Small Farms," by Professor Carroll, and one on "The Effect of Food on Milk," by Dr. E. J. Russell; The International Dairy Congress with a Paper on "How can Tuberculosis best be Eliminated from Dairy Herds," by F. J. Lloyd; The Dairy Show of 1907.

Bulletin of the Royal Botanic Garden, Kew, Appendix III.—1908.

New Garden Plants of the year 1907.

Bulletin of the Imperial Institute, Vol. VI, No. I.

Weight as a Factor in Seed Selection, with special reference to Cotton seed; Phosphate Deposits of Algeria and Tunis; Sunflower Seed and Oil.

Annual Report of the Agricultural Experiment Station, Wisconsin, 1906-7.

Observations on Sheep Breeding from records of the University flock, *G. C. Humphreys* and *Frank Kleinheinz*; Condimental stock foods, *F. W. Woll*; The Chemistry of Milk Curdling, *J. L. Sammis*; Nitrogen content of soils as affected by methods of farming, *A. R. Whitson, C. W. Stoddart*, and *A. F. McLeod*.

Annual Report of the Agricultural Experiment Station, Minnesota, 1906-7.

The Cost of Producing Farm Products.

Bulletin des Séances de la Société Nationale d'Agriculture, 1908, No. II.Compte rendu des travaux de la Société, 1906-7, *L. Passy*.*Arbeiten aus der K. Biologischen Anstalt für Land- und Forstwirtschaft*. VI. 2.Eine monographische Studie über die Chermiden, *C. Borner*.*Jahresbericht der Vereinigung für angewandte Botanik*, 1907.

Die Widerstandsfähigkeit der Wurzelbakterien der Leguminosen und ihre Bedeutung für die Bodenimpfung, *J. Simon*; Neuere Beobachtungen über Serradella- und Lupinenbau auf schwerem Boden, *B. Heinze*; Neuere bodenbakteriologische Ergebnisse und Probleme, *L. Hiltner*.

Landwirtschaftliche Jahrbücher. XXXVII. 2.

Untersuchungen über die Milchsekretion des Schweines und die Ernährung der Ferkel, *Prof. Ostertag* und *Prof. Zuntz*; Über die Entstehung des Steckrüben-geschmackes der Butter, *H. Weigmann*; Die Entwicklung und Organisation der Pflanzenzüchtung in Dänemark, Schweden und der Probstei, *Dr. Holtmeier-Schomberg*.

ADDITIONS TO THE LIBRARY.

[Note.—The receipt of *annual* publications of foreign agricultural and other departments, experiment stations and societies is not noted in the monthly list of additions to the Library, but a list of all such publications, which are regularly received, will be given from time to time.]

Great Britain—

Goodrich, C. L.—First Book of Farming. (259 pp.) London: A. Constable & Co., 1908.

Wright, John, and Horace J.—The Vegetable Grower's Guide. In two Vols. Vol. I. (352 pp.) London: Virtue & Co., 1908. 2s. net. per vol.

Encycloprdia of Agriculture. Edited by C. E. Green and D. Young. Vols. I and II. (582 + 536 pp.) Edinburgh and London: Wm. Green & Sons, 1908. 20s. net. per Volume.

Official Chemical Appointments. Second Edition. (172 pp.) London: Institute of Chemistry, 1908. 2s. net.

Pearson, R. H.—The Book of Garden Pests. (214 pp.) London: John Lane, 1908. 2s. 6d. net.

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Strasburger, E.—A Text-Book of Botany. Third English Edition. Translated by W. H. Lang. (746 pp.) London: Macmillan & Co., 1908. 18s. net.

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Ministry of Agriculture.—List containing the members of the Butter Control stations in the Netherlands, January, 1908. (32 pp.)

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Virgili, Felipe.—El Problema Agrario y el Porvenir Social. In two Vols. (203 + 204 pp.) Seville: Biblioteca Agraria Solariana, 1907.

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Vivian, A.—First Principles of Soil Fertility. (265 pp.) New York: Orange Judd Co., 1908.

Davidson, J. B. and Chase, L. W.—Farm Machinery and Farm Motors. (513 pp.) London: Kegan Paul, 1908.

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Bureau of Chemistry :—Circ. 37.—General Results of the Investigations showing the effect of Sulphurous Acid and Sulphites upon Digestion and Health. (18 pp.) Washington, 1907.

[Books may be borrowed from the Board's Library on certain conditions, which may be ascertained on application.]

THE JOURNAL OF THE BOARD OF AGRICULTURE.

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FARMYARD MANURE.

A. D. HALL, M.A.,

Director of the Rothamsted Experimental Station.

II. ITS VALUE AS A FERTILISER.*

A large number of analyses made at Rothamsted have shown that farmyard manure contains on the average about three-quarters of its weight of water, about two-thirds of one per cent. of nitrogen, one-quarter of one per cent. of phosphoric acid and one-third of one per cent. of potash, or per ton about 15 lb. of nitrogen, 5 lb. of phosphoric acid, and 7 lb. of potash. The composition, however, will vary very greatly both with the nature and feeding of the animals and the treatment and storage the manure has received.

The influence of the feeding is well illustrated in a series of analyses of two lots of dung made in adjoining boxes by bullocks receiving in one case roots and hay only, and in the other a fattening ration like in addition to the roots and hay. The two lots of dung were generally made up into separate mixens out of doors and sampled a month or two later when they were carted out to the land; in one case they were sampled as they left the boxes. Table VII shows the analytical results, not only as regards the total nitrogen, but also that present as salts of ammonia and as amido compounds easily changing into ammonia.

* See "Farmyard Manure. I. Losses during Making and Storage," *Journal*, Vol. XV., No. 1, April, 1908, p. 7.

TABLE VII.—Composition of Farmyard Manure made at Rothamsted from Roots and Hay only, or from Roots and Hay with Cake.

	Year.	Dry Matter.	Total Nitrogen.	Nitrogen as Ammonia.	Nitrogen as Amides.	Insoluble Nitrogen.	
Roots and hay only	1904	23·6	Per cent.	Per cent.	Per cent.	Per cent.	Made into mixen and stored.
Cake fed	"	24·0	0·577	0·046	0·067	0·464	
Roots and hay only	1905	29·5	0·716	0·079	0·096	0·541	Made into mixen and stored.
Cake fed	"	31·3	0·462	0·040	0·047	0·375	
Roots and hay only	1906	22·0	0·698	0·182	0·055	0·461	
Cake fed	"	24·3	0·690	0·097	0·049	0·544	
Roots and hay only	1907	25·3	0·589	0·125	0·053	0·411	Not stored.
Cake fed	"	25·5	0·815	0·377	0·033	0·405	"

TABLE VIIA.—Crop Returns from the above Manures.

	Year of Application.	Second Year.	Third Year.
		Mean of 4.	Mean of 3.
Unmanured plot	Per cent.	Per cent.	Per cent.
'16 tons per acre root and hay dung	100	100	100
" " cake-fed dung	132	136	117
	183	140	121

It will be seen that the cake-fed dung is always considerably richer in nitrogen, the average percentage being 0·73 as against 0·523, a superiority of nearly 40 per cent. Moreover, the extra nitrogen in the cake-fed dung is mostly in the highly available forms, the ammonia, urea and amido compounds which represent the digestible nitrogen of the cake; the insoluble nitrogen in the cake-fed dung is only 0·488 as against 0·415 in the dung made from roots and hay, a superiority of less than 18 per cent. That the superiority of the cake-fed dung as regards the soluble nitrogen compounds is not even more pronounced is due to the change back from ammonia into proteins effected by bacteria during storage; in 1907 when the dung was sampled as it left the yard both lots had practically the same proportion of insoluble nitrogen and both possessed an exceptional amount of ammonia which,

however, was three times as much in the cake-fed as in the other manure. These differences in composition are clearly reflected in the crops grown with equal quantities of the two manures, the weights of which are summarised and reduced to a common standard (the yield of the unmanured plots being taken as 100) in Table VIIA. The crops grown in these experiments were swedes, barley, mangolds and wheat in rotation, and after the two kinds of dung had been applied in a given year no other manure was used on those plots for the next three years. In the first year the increase in yield produced by the cake-fed dung was 83 per cent. as compared with an increase of 32 per cent. produced by the root and hay dung; in the following year the residue left by the cake-fed dung produced an increase of 40 per cent. as against 36 per cent. from the residue of the other manure; in the third year the increases produced by the residues still remaining were 21 and 17 per cent. respectively. The great difference in the value of the two manures comes in the first year, for though the superiority of the cake-fed dung may still be seen in the second and third year, it is almost covered by the experimental error.

The analyses in Table VIII show the change in composition which result from the storage of farmyard manure; it will be seen that old short dung contains a higher proportion of fertilising constituents (*i.e.*, when reckoned in the dry matter, because the amount of water present at any time is a matter of accident) than fresh dung, if it has been at all properly managed. We have already seen that though considerable losses of nitrogen take place during the rotting down of the manure, the losses of the non-nitrogenous organic matter are the greater, so that the manure becomes concentrated in nitrogen and still more so in phosphoric acid and potash. The active compounds of nitrogen, however, such as ammonium carbonate, grow less as the manure ages, since they are constantly being converted into insoluble protein-like bodies making up the bacteria themselves. These, of course, die and decay, giving rise again to soluble nitrogenous compounds, but the tendency is on the whole in the other direction, so that the older the manure the poorer it becomes in ammonia and kindred bodies. Hence old short dung is both slower in

its action and less caustic to germinating seedlings or the fresh delicate rootlets of tender plants; it can in consequence be used with more safety in the spring in potato drills or immediately beneath the seeds of swedes and mangolds, particularly on a light soil.

TABLE VIII.—Composition of Fresh and Rotten Farmyard Manure.

—	Fresh Long Straw Dung.	Same Manure Rotten.	Very Old Short Straw Manure.
Dry matter	Per cent. 33·83	Per cent. 24·6	Per cent. 46·86
Nitrogen	0·544	0·597	0·80
Phosphoric acid ...	0·318	0·454	0·627
Potash	0·673	0·491	0·674
Calculated on dry matter—			
Nitrogen	1·606	2·427	1·707
Phosphoric acid ...	0·940	1·846	1·338
Potash	1·989	1·996	1·438

TABLE IX.—Composition of London Stable Manure (B. Dyer).

—	Peat Moss.	Straw.	Mixed Peat and Straw.					
			Fresh.		After Storage.			I
			I	2	I	2	3	
Water	Per cent. 77·8	Per cent. 70·0	Per cent. 76·1	Per cent. 62·0	Per cent. 53·8	Per cent. 61·9	Per cent. 52·9	
Organic matter ...	18·0	24·3	19·3	26·4	17·5	22·0	23·0	
Nitrogen (soluble) ...	0·51	0·52	0·08	0·08	0·06	0·08	0·10	
, (insoluble) ...	0·37	0·10	0·46	0·62	0·58	0·68	0·79	
Phosphoric acid ...	0·37	0·48	0·33	0·45	0·49	0·56	0·66	
Potash	1·02	0·59	0·45	0·58	0·58	0·65	0·80	

Table IX shows a series of analyses made by Dr. B. Dyer of stable manure from London, such as is used in very large quantities by farmers and market gardeners, whose distance from London does not render the freight too great. The most noticeable thing in the five last analyses is the very low proportion of nitrogen that remains soluble; the frequency with which the stables are cleaned out in London, the open nature of the heaps and the many turnings to which the manure is subjected in collection and transit, all result in extreme aeration and a

rapid fermentation, with a corresponding loss of ammonia. The last three samples had been stored for eight or nine months on the farm; usually no great care is taken to consolidate such heaps so that the rotting down process goes on rapidly. In the above cases Dr. Dyer calculates that the loss in organic matter had been about 40 per cent., and in nitrogen from 15 to 20 per cent. during the storage.

From a consideration of the origin of the losses of nitrogen which take place during the making of dung, and of the above analyses, a good deal of guidance can be obtained as to the practical management of farmyard manure, which must always remain the fundamental fertiliser in the ordinary course of farming in this country. In the first place, since it is clear that the most valuable part of the manure resides in the liquid, far more care should be taken to preserve this than is usually the case. Whether the dung is made in boxes or in yards there should be sufficient depth to allow the manure to accumulate under the animal for the whole winter if need be, and the floors should be rammed with clay to render them watertight. Yards in particular should be constructed so that the accumulated manure is not above the general ground line outside, in which case there will always be a gradual soaking away of the liquid. On the other hand, yards made thus below the general ground level are apt to flood in heavy rain, so that the excess of water has to be run off to waste by means of a drain; this can, however, be avoided by cutting drains outside to keep land water from running into the yard and by seeing that all the surrounding sheds are properly provided with guttering. For real economy of litter, part at least of the yard should be covered; if the whole yard is covered a certain amount of care is necessary to prevent the dung getting at times too dry. Only just enough litter should be used to soak up the urine, and in order to prevent the liquid working up to the surface with the trampling of the beasts the floor of the yard should run down to a slight hollow, filled at first with something stiff like bean haulm or coarse peat moss, in which the excess of liquid may collect. Above all, the manure should be kept tightly trampled, because the greatest amount of loss takes place when the urine falls on a thin layer of loose strawy litter. The yards and boxes should be deep enough to carry

the animals through the whole winter so that they need not be cleaned out except when dung is wanted to go straight on the land. A box, for example, 8 ft. by 10 ft. in area with an available depth of 3 ft. would hold about 9 cubic yds., or 8 tons of dung when well trodden down. This would accommodate two beasts, each receiving 10 lb. of straw in food and 12 lb. in litter per diem for four months. As far as possible manure made in the spring should be left undisturbed until the autumn, when it may be carted out on to the stubbles and ploughed in where potatoes or roots are to be taken in the following spring. Even on the lightest soils the land will be more benefited thus than if the manure is made up into a mixen and put on immediately before the roots are grown. Sometimes, of course, a potato grower must have a supply of well rotted manure to put in the drills immediately before planting ; this can often be got from the lower layers of the earliest used boxes or yards, because a mixen should be avoided as much as possible. The principle to keep in mind is that every disturbance of farmyard manure results in loss and that the shorter the time which elapses between the dropping of the dung and its application to the land the less this loss of fertilising material will become.

In considering the value of farmyard manure as a fertiliser one has to keep in mind that it is an essential product of the farm, and that it must constitute the main source of manure for the land under the conditions of ordinary mixed farming, where artificial manures will only be used as supplements and not as its rivals. It is only in certain special cases, such as potato or hop growing, where the ordinary course of farming does not supply as much farmyard manure as is wanted, and where the question has then to be decided whether artificial manures or dung from the towns shall be purchased, or again whether stock shall be fattened solely with the view of making manure.

As a fertiliser the chief value of farmyard manure lies in the fact that it contains all the elements of a plant's nutrition—nitrogen, phosphoric acid and potash—though for a well-balanced manure the phosphoric acid is comparatively deficient. Moreover, the nitrogen is present in various forms of combination, varying from the rapidly acting ammonia compounds down

to some of the undigested residues which will remain for a very long period in the soil before becoming available for the plant. In consequence dung is a lasting manure, which accumulates in the soil to build up what a farmer calls "high condition," the state of affairs which prevails when the reserves of manure in the soil are steadily and continuously passing into the available condition in sufficient amount for the needs of the crop and there is no necessity for freshly applied active manure, a state of affairs which results in healthy growth and good quality. But, however marked the farmers' preference is for such lasting manures, the delay in realising the capital they represent means a certain amount of loss, besides which some of the constituents of farmyard manure are so slow acting to be hardly recoverable during the lifetime of the tenant. The imperfect recovery of the nitrogen from large dressings of farmyard manure is illustrated in Table X, which shows the nitrogen removed in the mangold crops at Rothamsted when grown with farmyard manure and other sources of nitrogen.

TABLE X.—Mangel Wurzel. Relation between the Nitrogen Recovered in Crop and that Supplied in Manure.

Plots.	Manure.	Average Produce per Acre of Roots.	Nitrogen.			
			Per Cent. in Fresh Roots.	Per Acre per Annum in Roots.	Supplied in Manure per Acre per Annum.	Recovered in Roots for 100 in Manure.
4 N	Nitrate of soda, 550 lb....	Tons. 17.95	0.164	Lb. 67.2	Lb. 86	Per Cent. 78.1
4 A	Ammonium salts, 400 lb.	15.12	0.145	49.3	86	57.3
4 C	Rape-cake, 2,000 lb. ...	20.95	0.148	69.4	98	70.9
1 O	Farmyard manure, 14 tons	17.44	0.162	63.3	200	31.6

In this case 78 per cent. of the nitrogen applied as nitrate of soda is recovered in the crop and 71 per cent. of that applied as rape-cake, while only 32 per cent. of that which was estimated to be included in the dung has come back in the crop. This low figure is partly due to the fact that the dung was put on year after year in considerable quantities (14 tons per acre); hence all the wasteful processes are increased and there is also a

great accumulation of nitrogenous material in the soil. How great the waste may become is seen by comparing the nitrogen supplied to one of the permanent wheat plots at Rothamsted, which receives 14 tons of farmyard manure per acre every year, with the nitrogen stored up in the soil and that removed in the crop. Table XI shows that only 26 per cent. was recovered in 50 years, and that nearly 57 per cent. has been lost, since it is accounted for neither in the crop nor in the soil at the end of the period.

TABLE XI.

Plot.	Manuring.	Nitrogen in Soil 9 inches deep, 1893.		Approximate Supply of Nitrogen in Manure in 50 Years.	Approximate Removal of Nitrogen in Crops, 50 Years (1844-1893).	Surplus of Nitrogen over Plot 3, unaccounted for in Crop or Soil.
		Per Cent.	Pounds per Acre.			
3	Unmanured	0.0992	2.570	Lb. --	Lb. 850	Lb. —
2	Farmyard manure	0.2207	5.150	10,000	2,600	5,670

These, however, are extreme cases ; on referring to the crops grown with the rich and poor dung on p. 162, where four crops in rotation are grown after each application of farmyard manure, out of 207 lb. of nitrogen supplied as dung made from roots and hay alone 144 lb. were recovered in the three following years, and of 257 lb. supplied as cake-fed dung 158 lb. were similarly recovered.

The extremely lasting character of those nitrogenous compounds in farmyard manure which are not recovered in the first year or two is illustrated in an exceptional manner in the Rothamsted experiments. On the grass land, for example, one plot received 14 tons of dung per acre per annum for eight years (1856-63) and then was left unmanured. Table XII shows that it has continued to give a larger crop than the unmanured plot alongside for more than 40 years. The table shows that in the year the application of farmyard manure was stopped the plot with the residues of the previous eight years manuring gave double the yield of the unmanured plot, in the following year the yield was still double, but from that time its superiority has slowly declined, though for the last 10 years it has still amounted to 15 per cent.

TABLE XII.—Produce of Hay per acre, First and Second Crops, showing Residual Effect of Dung.

Plot.	Manures.	Mean 8 Years, 1856-1863.		Season 1864.	Season 1865.	Average of—			
		Lb.	Lb.			Lb.	Lb.	Lb.	Lb.
2	Farmyard manure, 8 years (1856-1863)	4,804	5,392	2,848	3,726	3,748	2,791	1,943	
3	Unmanured since ...								
3	Unmanured continuously ...	2,665	2,688	1,296	2,374	3,025	2,621	1,686	
	Relation to produce of plot 3 reckoned as 100—								
2	Farmyard manure, 8 years (1856-1863)								
3	Unmanured since ...	180	201	220	157	124	106	115	
3	Unmanured continuously ...	100	100	100	100	100	100	100	

A similar experiment was made on the barley plots, one of which received 14 tons per acre of farmyard manure for 20 years from 1852 to 1871, and has since been left unmanured. Table XIII shows the yield from this plot, from the unmanured plot, and from the plot which has continued to receive 14 tons of farmyard manure every year, for the years immediately following the discontinuance of the dung and for successive five year periods since. It will be seen that though the yield has fallen continuously to about 40 per cent. of that of the continuously dinged plot, it still remains more than double that of the wholly unmanured plot.

In considering the results of these last two experiments it must be remembered that such a long duration of the residues of farmyard manure would not be perceptible in practice; they only become apparent when the soils are cropped to a state of exhaustion that would never be met with in ordinary farming experience.

Since only a portion, and that not the largest, of the nitrogen of farmyard manure is readily available, if it is the only manure supplied a crop in a good season is often unable to obtain its nitrogen rapidly enough, even though very large quantities are lying dormant in the soil. As an example we may take

TABLE XIII.—Total Produce per acre of Barley Plots, showing Residual Effects of Dung.

	Dung Every Year, since 1852.	Dung for 20 Years, Unmanured Since.	Unmanured Continu- ously.	Relation to Produce of Plot 7-2, reckoned as 100.		
	Plot 7-2.	Plot 7-1.	Plot 1-0.	Plot 7-2.	Plot 7-1.	Plot 1-0.
Mean, 1852-1871	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
" 1872	5,933	5,202	4,870	2,454	100	41
" 1873		6,561	5,165	1,282	94	25
" 1874		7,943	5,675	1,570	79	24
" 1875		5,825	3,955	1,922	71	24
" 1876		6,166	4,010	1,448	68	25
" 1877-1881		6,167	3,305	1,561	65	25
" 1882-1886		6,546	3,494	1,528	54	25
" 1887-1891		5,334	2,664	1,529	53	23
" 1892-1896		6,477	3,101	1,379	50	26
" 1897-1901		5,349	2,251	1,508	48	23
" 1902-1906		6,223	2,485	1,141	42	21
				1,301	40	21

the Rothamsted mangold crops for the years 1900 and 1907, when crops considerably above the average were grown, and compare the yields obtained when farmyard manure was used alone and in conjunction with nitrate of soda, with that given by a purely artificial dressing containing nitrate of soda.

TABLE XIV.—Yield of Mangolds at Rothamsted, 1900 and 1907, Roots only.

Year.	Farmyard Manure = 200 lb. N. + Phosphoric Acid and Potash.	Phosphoric Acid and Potash + Nitrate of Soda = 86 lb. N.	Farmyard Manure = 200 lb. N. + Nitrate of Soda = 86 lb. N.	Farmyard Manure = 200 lb. N. + Phosphoric Acid and Potash + Nitrate of Soda = 86 lb. N.
1900	Tons. 28·0	Tons. 33·1	Tons. 41·3	Tons. 41·8
1907	" 26·5	" 32·8	" 41·4	" 42·1

The farmyard manure, though it contained about 200 lb. of nitrogen, could not provide the rapidly-growing mangolds with as much nitrogen as did the nitrate of soda containing 86 lb. of nitrogen, since it only grew 27·2 tons of mangolds against 33 tons with nitrate of soda, and this notwithstanding

the great accumulation in the soil of the residues of 30 years' previous manuring with dung. Only the nitrogen was concerned in these differences because both the plots received the same phosphoric acid and potash. Moreover the crop had by no means reached its limit, for an addition of nitrate of soda to the dung increased the crop to 41·4 tons, and here again only the nitrogen is concerned because on a further plot where phosphoric acid and potash were added to the combination of dung and nitrate of soda there was but a very slight additional increase of crop.

From other experiments it has been repeatedly demonstrated that where the grower is aiming at a very large crop it is more economical to attain this by using dung and a mixture of active artificial fertilisers than by increasing the amount of dung; 20 loads of dung, with 1 to 2 cwts. of nitrate of soda and 3 cwts. of superphosphate costing about 30s., will generally be more effective than 40 loads of dung, the second 20 loads which cannot be charged at less than £4 or £5.

Farmyard manure has frequently been blamed for carrying the seeds of disease and of weeds in an unchanged condition and thus contaminating the land for other crops. When bullocks have been fed with swedes affected with "finger and toe" and the uneaten fragments of the roots are thrown among the litter, the spores of the disease have been found to live unharmed through the making and rotting of the manure, so that fresh land may thus become infected when the dung is carried on to it. Similarly when hop bines are used as litter the spores of the hop mildew are not destroyed, but no other cases of transmission of disease have been investigated. As regards weeds, farmyard manure is most commonly employed for root crops, in which case the usual cultivations will keep down any weeds whose seeds are in the dung, and when the dung is put on grass land the weed seeds stand little chance of establishing themselves.

The value of farmyard manure to the land is, however, by no means confined to its fertilising action; its physical effects upon the texture and waterholding powers of the soil are equally important, indeed for some crops and particularly in droughty seasons they count for more than fertilisers towards ensuring a good yield. The farmyard manure as it

rots down in the soil goes to restore the stock of humus, which otherwise is always tending to oxidise and diminish, and the humus considered merely from the physical side contributes largely to the fertility of the soil. In the first place it improves the texture of all soils; to sands it gives cohesion and water-retaining power, while by loosely binding together the finest particles of clay soils it renders them more porous and friable. When a piece of old grass land even on a stiff soil has been ploughed up it is easy to see the beneficial effect of the humus that has been accumulated; after the winter the plough slice will have crumbled naturally so as to harrow down at once to a mellow seed bed, whereas a neighbouring piece of the same soil that has long been under arable cultivation will only show a number of harsh intractable clods. The importance of a good seed bed to the future well being and ultimate yield of the crop can hardly be exaggerated; it is the basis of all good farming, so that even if the fertilising properties of farmyard manure can be replaced by artificial manures some other means, such as the ploughing in of green crops, must be resorted to in order to maintain the stock of humus. Of course the value of humus, and in this respect of farmyard manure, will vary on different soils and with different crops; cereals, for example, are comparatively unaffected by its absence, as may be seen by the manner in which Mr. Prout grows cereals almost continuously on his strong soil with artificial fertilisers only, but root crops are very dependent on a mellow seed bed. This may be seen on the Rothamsted plots; the wheat which has now been grown on the same land for 63 years comes as well and yields as big crops on the plots receiving only artificial manures as it does on the plot receiving dung, but on the mangold plots the result is different. Where artificial manures containing no organic matter have been supplied the tilth is bad, and in trying seasons, when drought succeeds heavy rain soon after sowing, the plant obtained is so imperfect as to reduce the yield considerably. If the conditions are favourable to germination and the plant once becomes established, then, as we have previously seen in Table XIV, the plot manured with minerals and nitrate of soda will grow a bigger crop than that receiving dung, but this superiority is masked in many seasons by the defective plant.

The proportion the number of roots on each plot bears to the possible number, as calculated from the width of the rows and the distance apart at which they are singled, for three plots, one of which receives farmyard manure only, one minerals and nitrate of soda, and one minerals, together with an organic source of nitrogen in the shape of rape cake, is as follows (Average of Seven Years, 1901-07):—

Farmyard Manure	...	...	...	...	...	70 per cent.
Minerals and Nitrate of Soda	...	...	...	...	62	"
Minerals and Rape cake	...	...	...	...	83	"

These are average figures for a period which includes several years when a very good plant was obtained all over the field, and only one of the occasional years when the plant failed entirely on the plots receiving no organic manure. It is noticeable that the plot receiving rape cake (2,000 lb. every year) is actually better as regards the number of plants it carries than the dunged plot, because the repeated dressings of an organic manure like rape cake supply enough humus to maintain the texture without getting the soil too open, a defect which is now beginning to overtake the plot so continuously treated with large amounts of farmyard manure.

A soil which has been enriched in humus through repeated applications of farmyard manure will resist drought better than one in which the humus is low; the difference is seen not so much in the greater amount of moisture present in the soil containing humus as in the way it will absorb a large amount of water temporarily during heavy rainfall and then let it work more slowly down into the soil, thus keeping it longer within reach of the crop. Good examples are afforded by the Rothamsted plots; samples of soil from the wheat land were taken on 13th September, 1904, on the previous day 0.262 in. of rain had fallen, but for nine days before there had been little or no rain. The portions of the plots from which the samples were drawn had been fallowed through the summer so that the drying effect of the crop is eliminated. Samples were also taken from the barley plots on 3rd October of the same year; 0.456 in. of rain had fallen on the 30th September, before which there had been 15 days of fine weather. Table XV shows the water in the soil of the unmanured and the continuously dunged plots respectively, as percentages of the fine earth from which the stones had been sifted.

TABLE XV.—Percentages of Water in Rothamsted Soils.

Depth.	Broadbalk Wheat.		Hoos Barley.	
	Unmanured.	Dunged.	Unmanured.	Dunged.
0-9 inch ...	Per cent. 16·0	Per cent. 19·3	Per cent. 17·0	Per cent. 20·7
9-18 „ „	19·8	17·0	22·5	17·7
18-27 „ „	23·3	18·4	22·1	18·3

It is thus seen that in both cases the dunged soil, rich in humus, had retained more of the comparatively recent rainfall near the surface, so that the top soil was moister while the subsoil was dryer. The difference in favour of the surface soil is about 3·5 per cent., which on that soil would amount to about 30 tons per acre or approximately 0·3 in. of rain. It is thus seen that the surface soil of the dunged plot had retained practically the whole of the preceding rainfall, and the greater dryness of the subsoil is due to the way the soil has kept back the small rainfalls, which have evaporated instead of being passed on to the subsoil, as happens on the unmanured plots. The same fact is illustrated by the behaviour of the drains which run below the centre of each of the wheat plots at a depth of 30 in.; below the dunged plot the drain very rarely runs, only after an exceptionally heavy and continued fall, whereas the drain below the unmanured plot runs two or three times every winter. Putting aside the greater drying effect of the much larger crop on the dunged plot the difference is mainly due to the way the surface soil rich in humus first of all absorbs more of the water and then lets the excess percolate so much more slowly that the descending layer of over-saturation, which causes the drain to run, rarely or never forms.

The water-retaining power of the dung may also be seen in the superior yield of the dunged plots in markedly dry seasons. A comparison of the yield of wheat in bushels on Plot 2, receiving 14 tons of dung, and Plot 7, receiving a complete artificial manure, for the years 1879, which was exceptionally wet and cold, and 1893, which was hot and dry throughout the growing period of the plant, is given below.

The rainfall for this period, *i.e.*, for the four months March to June, was 13 in. in 1879 and only 2·9 in. in 1893.

		1879.		1893.		Average, 51 Years.
Plot 2	...	16·0	...	34·25	...	35·7
" 7	...	16·25	...	20·25	...	32·9

The average yield on the dunged plot is about 3 bushels more than on Plot 7, but in the dry year its superiority amounted to 14 bushels, whereas in the very wet year the two plots sank to the same low level. In a bad season the bacterial changes which render the plant food in dung available for the crop go on very slowly.

The application of farmyard manure to grass land, not only has a fertilising and water-retaining effect, but is also valuable from the way it acts as a mulch and affords the springing grass in the early months of the year some protection from cold and drying winds. At Rothamsted on the permanent grass plots it is often noticed that the plots which receive applications of farmyard manure once in every four years start a little earlier and make a quicker growth than the others. This mulching effect partly accounts for the great value attached to dung as a dressing for permanent grass land on open chalky soils, as in Wiltshire, where it is customary to farm the arable land entirely with artificial manures, aided by the folding off of catch crops, and reserve all the farmyard manure made for the grass. Such a practice is wasteful of the farmyard manure as a fertiliser, for the loss of nitrogen from a layer loosely spread over the ground until it decays is considerable, but the waste is tolerated in view of the gain to the physical or mechanical condition of the land.

In ordinary mixed farming undoubtedly the best way of utilising farmyard manure is to apply it to the root crops, and especially to mangolds and potatoes. Swedes require much less nitrogen than do the other root crops; they also require a firm but fine tilth, and in consequence not more than 10 to 12 tons of dung per acre should be given for swedes, and it should be applied in the autumn in order that it may become well rotted down before the spring cultivation begins. But for mangolds and potatoes up to 20 tons of dung per acre can be profitably employed, and it can if necessary be applied immediately before sowing. Any surplus dung after the re-

quirements of the root crops have been satisfied is probably best given to the young seeds in the early winter, to act both as a fertiliser and as a mulch. The seeds benefit greatly, and at the same time much of the added fertility is retained for the corn crop that follows ; manuring the young seeds is certainly preferable to manuring the old ley before it is ploughed up for wheat or oats. A certain amount of the farmyard manure made on the farm should, however, always be reserved for the meadow land, especially on light soils and on land comparatively newly laid down to grass. Of course, dung would be wasted on rich grazing land ; it is the thin light soils that are cut for hay, or grass land that has only been laid down for a few years and has had no time to accumulate a stock of humus, which are most benefited by an occasional dressing of farm-yard manure—once in every four or five years.

BROOM-RAPE.

Amongst plants which are usually classed as weeds—not merely because they are “out of place” but because they are harmful or of no value—there are several which are parasitic in character, and for certain reasons of an insidious nature. In a previous number of this *Journal* some account has been given of the parasite Dodder,* and it is now proposed to deal with another plant pest known as Broom-rape. Although it is perhaps of less economic importance than dodder, yet in some districts the broom-rape which attacks the clover crop may be the cause of much loss. Several species are harmful to other plants, and the more important of these will here be described.

Description of Broom-rapes.—The broom-rapes are included botanically under the order *Orobanchaceae*, of which there are 11 genera, and according to Bentham and Hooker 150 species ; of these about 100 are members of the genus *Orobanche* (or broom-rapes). Few of them, however, occur in the British Islands. These plants are annual, leafless, brownish root-parasites, containing no chlorophyll or green colouring matter. The base of the stem is somewhat tuberous and scaly ; the stems are generally stout and scaly, and usually occur singly ; while the



M. Smith, del.

BROOM-RAPE (*Orobanche minor*, Sutt.)

flowers, with one or two exceptions, grow in lax or dense spikes. The whole plant is attached, by means of suckers or haustoria, to the roots of the plant upon which it is parasitic. The word *Orobanche* is derived from two Greek words signifying a *vetch* and *to strangle*, and the name of *broom-rape* has doubtless arisen from a species which infests broom, so being a *robber of broom*.

O. minor, Sutt.—The Lesser Broom-rape, *O. minor*, is the species which is the farmer's especial trouble, as it attacks clover, and may do great harm when established amongst that crop. It occurs on a variety of plants, and is found southwards from the Border counties. The flowers (see coloured plate) are about $\frac{1}{2}$ in. in length, and are variously described as reddish, purplish or yellowish brown in colour, many flowers being crowded in a long spike. The stem is somewhat slender compared with some other broom-rapes, and 6 in. to nearly 2 ft. in height. This species flowers from June to October. There are several sub-species. *O. minor* is found in Germany only in a few States, but not infrequently in Thuringia and in the Rhine country, especially Baden, where it has been so harmful to clover that it has received the name of "clover devil" (*Kleeteufel*).* Thaer also applies this name to *O. minor*. This species is recorded by Kirchner† as occurring in Germany on *Trijolium repens*, *T. hybridum*, *T. pratense*, *T. incarnatum*, Serradella, *Lotus corniculatus*, Carrots and Fuller's Teasel (*Dipsacus fullonum*).

O. major, Linn. (= *O. elatior*, Sutt.).—This species of broom-rape is parasitic on composites. Hooker says‡ it is parasitic on *Centaurea Scabiosa*, but is rare. It is found, chiefly in the eastern counties, from York and Durham to Sussex and Somerset, and also in South Wales. The flowers are yellowish and in dense spikes, flowering occurring from June to August.

Orobanche Rapum-genistae, Thuill.—This species, known as Larger Broom-rape, is brownish in colour, with flowers about 1 in. in length and of a yellow and purplish tint,

* *Pflanzenkrankheiten*, Dr. Paul Sorauer, p. 21. (According to Pritzel and Jensen the word "Kleeteufel" is the vernacular term employed in Switzerland for species of *Orobanche* generally).

† *Die Krankheiten und Beschädigungen unserer Landwirtschaftlichen Kulturpflanzen*, Dr. O. Kirchner, p. 317.

‡ *The Students' Flora of the British Islands*, p. 309.

flowering taking place from June to August. The flowers occur in dense spikes. It is found in Great Britain from Dumfries southward, in Ireland, and in the Channel Islands. On the Continent it is found in several countries. It is parasitic on the roots of a few shrubby leguminous plants, such as broom and gorse.

O. ramosa, Linn.—Hemp is occasionally infested with this species, whilst on the Continent it attacks tobacco. It is figured by Thaer* as brownish in colour, with light blue flowers, and is said to bloom in September. According to Kirchner† the stems are pale yellow in colour, and the flowers light blue or white.

Other Species.—Several other species occur in this country, but they are of little importance. *O. caryophyllacea*, Sm., is found in Kent on *Galia*, *Rubi*, &c. *O. rubra*, Hook, the flowers of which are odorous, may be found from Ross to Cornwall on *Thymus*. *O. purpurea*, Jacq. (= *O. cærulea*, Vill.) is a local species in Herts and Norfolk and Hants to Cornwall. It is said by Kirchner‡ occasionally to attack Yarrow (*Achillea Millefolium*). *O. Hederae*, Duby, is confined to ivy as its host.

Description of Seeds.—The seeds of broom-rape are exceedingly small and light, almost dustlike, and are contained in two-valved, many seeded capsules. Percival§ says several hundred seeds are produced from a single flower, while Sorauer|| quotes Wentz as having seen 70 to 90 seed-capsules, containing on an average 1,500 seeds, on a single plant. Since they are so small, the seeds of this parasite may be separated with ease from clover and other agricultural seeds. When shed from the capsules, however, the seeds are easily distributed by the wind.

Life History.—It may be said at the outset that the seeds only germinate on coming into contact with the roots of a host plant. Some species are confined to one host, while others are found on various plants. The following remarks refer especially to *O. major*, Linn. (= *O. elatior*, Sutt.) and *O. minor*,

* *Landwirtschaftliche Unkräuter*, Dr. A. Thaer, 3rd Ed. 1905, p. 34.

† *Op. cit.*, p. 317.

‡ *Op. cit.*, p. 259.

§ *Agricultural Botany*, John Percival, p. 559.

|| *Op. cit.*, p. 21.

Sutt., which are the most important species agriculturally. On germination, the seedlings are threadlike, somewhat resembling those of dodder. The seedling of *O. minor*, becomes attached to the roots of the host by means of a sucker, thereafter developing a thick fleshy stem which, says Percival,* "grows upward through the soil, appearing above it like a pale brownish-red asparagus shoot from 6 in. to 18 in. in length." This stem gives rise to the spike of flowers.

Prevention and Remedy.—1. The chief means of preventing infection on clean farms undoubtedly lies in using absolutely clean seed, free from weed seeds. Although the seed of broom-rape is easily removed from clover, yet on account of its minute size it occasionally happens that samples are not entirely free from the pest, and clover fields may become infested. The second cut of clover is sometimes almost, or quite, ruined.

2. It has been recommended that wherever the plant is seen it should be pulled up, and this may be done with ease, as the broom-rape readily separates from the clover root. When it occurs only in small patches it may be dug out and burnt. If allowed to come to maturity the seeds will be scattered broadcast in large quantities. Sorauer† says that in case of widespread infection prevention of seeding is the chief method of combating broom-rape, because spreading by shoots or scions is slow and easily preventable by uprooting the plants.

3. Clover should not be grown on infested land for a number of years.

4. Manures which will encourage the growth of the clover and aid it in resisting the attack may be employed with advantage. For example, ground lime and potash manures judiciously applied may be of value in this way.

5. Percival says, "When once established it is difficult to eradicate before doing considerable injury to the crop, and nothing short of ploughing up the clover will exterminate the pest entirely." In this connection Frank says‡ that badly infested fields should in good time—that is after the first cut, before the pest blooms—be deeply broken up, so that the clover

* *Op. cit.*, p. 559.

† *Op. cit.*, p. 21.

‡ *Kampfbuch gegen die Schädlinge unserer Feldfrüchte*, Dr. A. B. Frank, p. 251.

plants are pulled up, and the land employed for some years for some other crop. A case is recorded in which the pest again attacked clover sown after an interval of seven years between the clover crops, the later crop being so badly infested that it had to be ploughed up.

6. In dealing with red clover and trifolium, Kirchner suggests* that red clover when attacked may be replaced by lucerne or sainfoin.

Description of Plate.

A.—*Orobanche minor*.

B.—*O. minor*, the inflorescence grown out. 1, bract; 2, calyx and pistil; 3, corolla laid open; 4 and 5, anthers (1 to 5 enlarged); 6, seed, natural size; 7, seed, enlarged; 8, fruit of *Trifolium pratense*, natural size; 9, the same enlarged; 10, seed of *Trifolium pratense*, natural size; 11, the same enlarged.

POULTRY FATTENING.

CECIL L. BYRNE.

The following notes on fattening fowls have been communicated to the Board by Mr. Cecil L. Byrne as a continuation of his article on poultry fattening which appeared in this *Journal* for May, 1906, Vol. xiii., p. 73.

Overfeeding.—Many people overfeed during the trough-feeding period, and also make the food too solid; the result is that the bird gets what they call in Sussex "clung," i.e., the food is not digested. One indication of this is that the bird sits huddled up in the pen, while other signs are cold feet and the very blue and distinct appearance of the veins in the shanks, showing congestion of the system and bad circulation. The remedy is to reduce the feeding in such cases at once, otherwise the bird will probably die. An entire fast for one day may be necessary and then decreased feeding. A bird will only increase in weight from digested food.

When trough-feeding is commenced the food should be thin enough to be able to be poured out of the spout of a can, and not stiff like porridge. The food may be a little thicker on the third or fourth day. On no account must the birds be overfed during the first few days, but they must be gradually induced to take more. They are invariably feverish at first from

fretting and other causes, especially if they have come off a journey. But during the last few days of trough-feeding the birds should be allowed to eat as much as they like, the object being not so much to put on flesh, though that is necessary, but to expand the crop gradually, so that it may be able to hold more when cramming commences.

No one but a practical crammer can appreciate the difference that exists between the crop of one bird and another. No two crops appear to be of the same capacity, and expert crackers lay themselves out to increase the capacity of a crop gradually ; it is surprising to what an extent a small crop can be enlarged in this way. Some large birds have small crops, and this is one reason why a thin bird will often fatten more rapidly than a fairly well covered bird. If it has a larger crop it will be able to consume more food and thus outdistance its companion, which with its smaller crop capacity can only take limited advantage of its chance of unlimited food.

Position of Bird when being crammed.—A novice usually makes the mistake of huddling a bird up under his arm so that the bird's crop cannot expand properly during the cramming operation. This frequently leads to a false passage being made with the throat tube. Great care must always be taken to hold the tongue down, or the tube may be forced into the wind pipe. This is frequently done by beginners, and to shoot food down the wind pipe means death.

If the crop should be perforated it is best to kill the bird, as it may result in blood poisoning ; it is possible to sew the crop up, but this is hardly worth while in the case of a fattening bird.

Quantity of Food.—The quantity of food required for cramming may be put roughly at $7\frac{1}{2}$ gallons for 120 birds. It is not wise to use too much skimmed milk in the food, as a bird may get "clung" if too much is given. Two gallons of food would require about $1\frac{1}{2}$ gallons of liquid and $\frac{1}{2}$ gallon of meal (weighing about $3\frac{1}{2}$ lb.) ; it is not advisable that the whole of this $1\frac{1}{2}$ gallons should be milk, it is far better that it should be half milk and half water. It must be remembered that nourishment is only derived from the food that is digested, and a certain amount of water is desirable so that the food may be assimilated.

Roup.—It is a common thing where a number of birds are

purchased for cramming purposes to find some roupy birds among them. This disease is known as "squack" among the Sussex crammers. A bird will not fatten in this condition, although many birds that enter the pen in a roupy condition are satisfactorily fattened in Sussex. The best treatment is to place the birds suffering from roup apart from the other birds ; then to clear all roupy matter from the mouth and throat. A little Condyl's fluid may be used to wash out these parts with advantage. After this a few drops, five or six only, of turpentine should be poured down the birds' throat. Turpentine is very efficacious in such cases, two or three doses often effecting a cure. A little turpentine sprinkled under the pens may also be recommended ; this will produce an odour that overcomes the unpleasant smell to be found amongst fattening birds. It can be mixed with hot water and then sprinkled about.

APPLE "SCAB" OR "BLACK SPOT."*

By E. S. SALMON, F.L.S.,

Mycologist to the South Eastern Agricultural College.

There is no single fungus disease—with the possible exception of "canker"—which at the present time is doing so much damage in apple plantations and orchards in England as the "scab" or "black spot." Losses of many thousands of pounds are being occasioned annually by this disease. In severe attacks it may injure the crop to such an extent that it is not worth gathering, and wherever it is present even to only a slight degree, it depreciates the market value. The thoroughly inferior appearance of the average English apple exposed for sale in provincial towns is due almost entirely to the prevalence of "scab." The value of the improved scientific methods adopted by growers in foreign countries and in our colonies is nowhere more clearly seen than in the clean apples exported to us.

Description of the disease.—The disease usually first attracts the attention of the grower by its injury to the young fruit. It is not uncommon to find, in the case of orchards where

* Conidial stage, *Fusicladium dendriticum*, Fckl. ; Ascigerous stage, *Venturia Pomae*, (Fr.) Wint.

"scab" has been prevalent for a number of seasons, that the young apples on certain varieties of trees become so severely attacked that they present the appearance reproduced in the photograph in Fig. 1. The further growth of apples, which are attacked as severely as this, is almost entirely prevented. If, as in the case of less susceptible varieties of apples, the disease does not altogether prevent further growth, the apple by the time it has attained full size is either misshapen owing to the diseased parts having been prevented from developing, or its appearance is disfigured by the presence of a number of "black spots" or "scabs" on the skin.



FIG. 1.—Young apples attacked by the Apple Scab or "Black Spot" fungus; showing the cracking seen in severe attacks of this disease.

Now the presence of "scabby" fruit on a tree is almost certain indication that the disease is existing on the leaves or young wood of the same tree, or of neighbouring trees. And it is to the prevention of the growth of the fungus on the leaves that the grower should pay special attention, since if the leaves are sprayed and kept clean, the disease can be easily suppressed.

If the leaves are examined closely, they will be found to bear the fungus, usually on the upper surface of the leaf, but often on the lower surface as well. The exact appearance of the disease on the leaf of the apple varies considerably according to the variety, but in every case the part actually

infested is marked by dark brown or olive-green "sooty" patches. Sometimes these patches are separate from one another and very distinct—as in Fig. 2; at other times the fungus follows more or less closely the veins or "nerves" of the leaf on its upper surface (Fig. 3); in the case of other varieties, again, the leaf, where it is attacked, forms on the upper surface little swellings or eruptions, over which the fungus spreads its dark brown spores (Fig. 4); or, finally,



FIG. 2.—The Apple Scab or "Black Spot" fungus attacking the leaf. On "Bismarck"; distinct "sooty" patches are formed on the under-surface (including the midrib) of the leaf. A healthy leaf is shown to the right.

the whole of the upper surface of the leaf may be coated almost continuously with a very thin dark brown "sooty" covering.*

If a section of an apple leaf is cut across one of the "sooty" patches on the leaf, and placed under the microscope, it presents the appearance shown in Fig. 5. The spawn (*mycelium*) of the fungus can be seen running between the cells in the interior of the leaf (Fig. 5*b*), where it feeds on

* In some parts of Kent the disease on the leaves is known under the name of "soot" or "sooty" fungus, but its connection with the "black spot" of the fruit has not been recognised.

the cell-sap; at the surface of the leaf it sends out into the air short branches, at the ends of which the minute dark-brown spores, or *conidia*, are produced. (Fig. 5c). Some millions of these minute spores are produced at each "sooty" place on an apple leaf, and each spore on being carried by the wind or rain, or by insects, to the fruit is able to infect it at once, and produce on it the "scab" or "black spot."

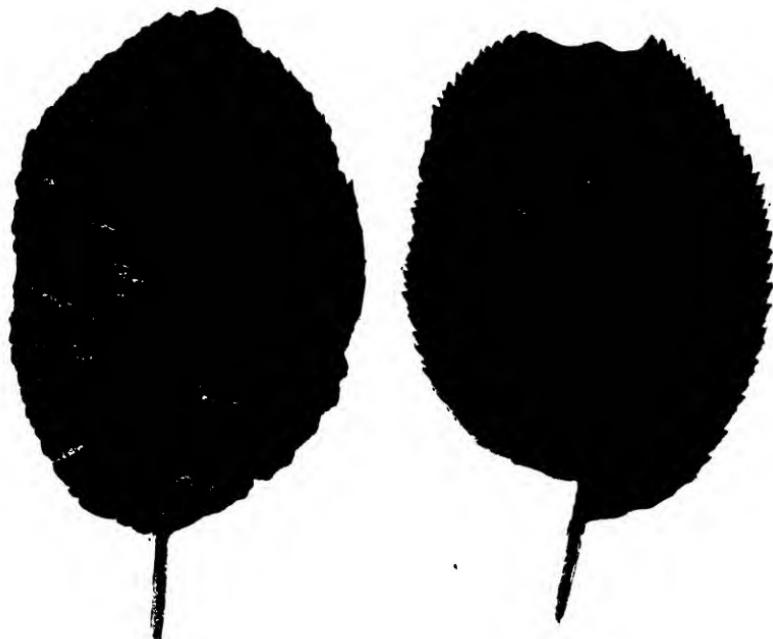


FIG. 3.—The Apple Scab or "Black Spot" fungus attacking the leaf. The dark-brown "sooty" patches of the fungus follow more or less the course of the veins of the leaf.

FIG. 4.—The Apple Scab or "Black Spot" fungus attacking the leaf. "Warner's King"; the dark-brown "sooty" patches of the fungus occur on little swellings on the upper surface of the leaf.

It is chiefly in consequence of the grower allowing the fungus to increase on the leaves and to produce there its millions of spores, instead of keeping the leaves healthy by spraying, that his apples become "scabby" each season. Other injury, too, apart from the infection of the fruit may result. If the leaves are severely attacked, a premature shedding of the foliage results, with a marked injurious effect on the season's growth of the tree.

But, not uncommonly, another annual source of infection

occurs. In consequence of the increasing extent to which orchards and plantations in Kent were suffering, apple "scab" was one of the first diseases which I investigated on being appointed mycologist to Wye College. A number of cases were brought to my notice where young trees in quite isolated positions suffered regularly from the disease year after year, suggesting that a continual source of infection was present on the trees. An examination of the trees resulted in the finding of the disease on the young wood. This was the first time the occurrence of "scab"-infested wood had been noted in this

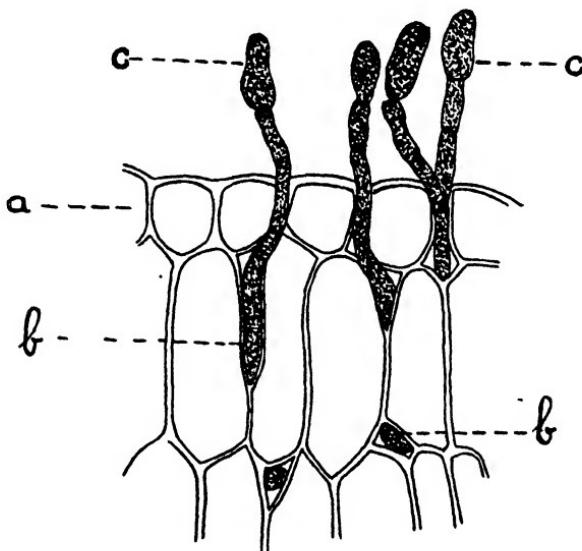


FIG. 5.—Part of a section through one of the "sooty" patches on the "Bismarck" leaf shown in Fig. 2; (a), epidermal cells of the leaf; (b), portion of the spawn (*mycelium*) of the fungus feeding on the sap of the leaf; (c), ripe spores (*conidia*) of the fungus.—Highly magnified.

country, although this stage had been reported from the Continent and the United States.

The general appearance of young wood attacked by the "scab" is shown in the photograph in Fig. 6. According to the variety of apple attacked, its appearance varies considerably; in some cases, e.g., on "Cox's Orange Pippin," the diseased wood becomes somewhat swollen and prominently blistered, as is shown in Fig. 6A; in other cases, e.g., on "Wellington," the blistered appearance is less prominent, and the shoot is not swollen (Fig. 6B). In other cases the

"scab" produces isolated characteristic markings, which give a "pocked" appearance to the wood. Severely attacked young shoots may—as in the case of those of "Lord Suffield," shown in Fig. 7—be "blistered" almost continuously over the surface, and the bark will then subsequently peel off ~~in~~

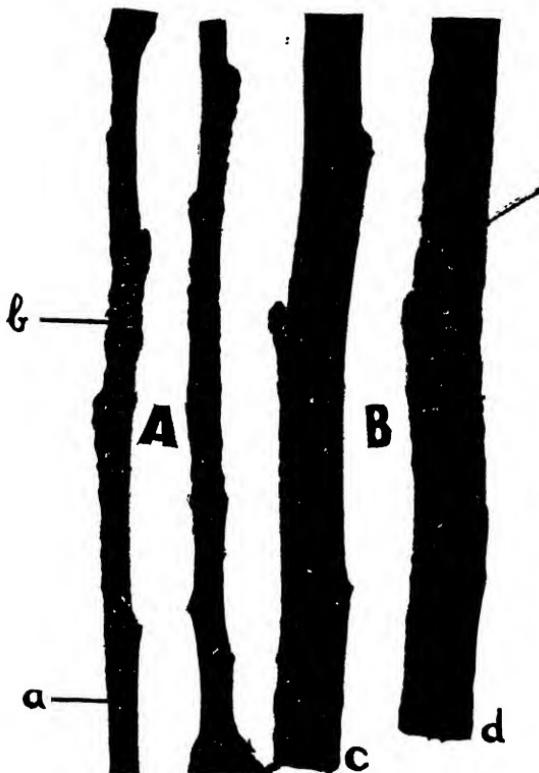


FIG 6.—The Apple Scab or "Black Spot" fungus attacking the young wood of apples :—(A), on Cox's Orange Pippin : (a), healthy wood ; (b), diseased wood, the blistered appearance being due to pustules of spores breaking through the bark. (B), on Wellington : (c), healthy twig ; (d), twig with diseased patch below.

flakes. I have known such attacks to be mistaken for "canker" by growers. No "rot" or "canker" is caused by the "scab" fungus on the wood*; the growth of the shoot, however, is often much weakened.

If a section of "scab"-diseased wood is cut across a

* I have, however, frequently met with cases where the young wood has been attacked by both "canker" and "scab" on one and the same shoot. It is not improbable that the "canker" spores may find an entrance into the wood at places where the bark has been ruptured by the "scab."

"blistered" part, such as is shown at *Ab* in Fig. 6, it will present the appearance seen in Fig. 8. At (*a*) we see some of the cells of the wood; seated on these is the cushion-like mass of fungus spawn (*b*) which forms the "blister," and covering its surface on the outside is a layer of dark-brown spores (*c*).

Any of these spores on being blown or carried to the leaves or young fruit in the spring will immediately infect them and produce the appearance shown in Figs. 1 to 4.

During the past two seasons I have examined a number of orchards and plantations with the object of ascertaining what varieties of apples are susceptible as regards the young wood. I have found scab-infested wood on the following varieties:—Cox's Orange Pippin, Lord Suffield, Ecklinville Seedling and Yellow Ingestre or Summer Pippin—all severely attacked; Wellington, Cox's Pomona, Warner's King, Gladstone, Councillor and White Transparent—less severely.

According to my experience, the young wood of "Cox's Orange Pippin" is almost invariably scab-infested if the disease is in the neighbourhood. I have known instances where young trees of this variety bearing scab-infested wood have been sent out of nurseries. In rare cases I have found a few of the weaker shoots actually killed by the disease; consequently it must be reckoned as one of the most susceptible varieties as regards its wood. The wood of "Lord Suffield," too, is very susceptible; I have known cases where it has become so scab-infested—the bark peeling off in flakes—that the owners have grubbed the trees, thinking them permanently ruined.

As regards its direct effect on the young wood, however, apple scab is not a serious disease except in the case of very severe attacks on a few specially susceptible varieties. The chief danger arising from the presence of "scab"-diseased wood is that the pest thus persists on the trees through the winter months, with the result that apple orchards and plantations which have suffered for several seasons from "scab" are often never wholly free from the disease at any time of the year. In these cases the life-history of the fungus is as follows:—In the spring the spores blow from the diseased wood to the young leaves and the fruit as it is formed, then when the

fungus has developed rapidly and profusely (as it does) on the leaves, spores are continually blown or carried during the summer to the riper fruit and also to the young wood; on the latter the fungus persists in a dormant state through the winter months and in the following spring restarts the disease on the leaves and young fruit.

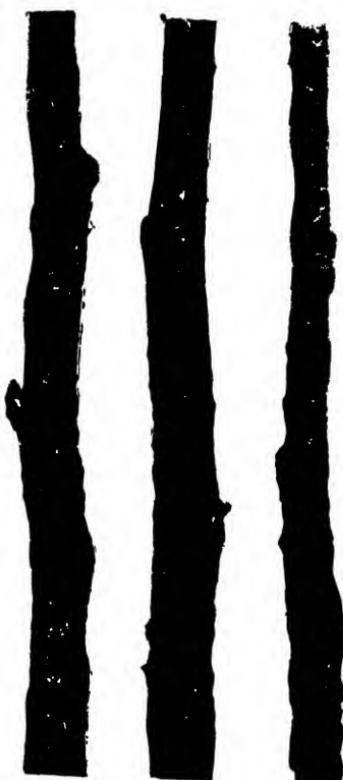


FIG. 7.—The Apple Scab or "Black Spot" fungus attacking the young wood of apples:—Infested twigs of "Lord Suffield"; in places the bark is beginning to peel off in flakes.

In mixed orchards and plantations those varieties whose wood is liable to be attacked should be examined in the winter, and if the disease is present to any serious extent the winter wash mentioned below should be applied.

But a word of warning must be given here. It is simply a waste of money to apply indiscriminately a winter-wash to a large acreage of trees with the idea of getting rid of apple "scab." Apple "scab" is not a disease which can ever

be cured by winter washing alone; the protection of the leaves by the Bordeaux mixture spray, described below, is always necessary. It is scientifically and economically sound to wash for apple "scab" in winter only those varieties of trees whose wood has been ascertained to be severely "scab"-infested.

It is to be noted that apple "scab" when present to even only a moderate degree, not only destroys the appearance of the apple to a marked extent, but also affects most injuriously its keeping qualities. "Scabby" apples, when stored, soon begin to rot. The flesh of the apple at the place where the "black spot" or "scab" exists becomes gradually soft, and lets in the spores of the various fungi ("moulds," &c.) which are floating about in the air. The spores of these fungi on once gaining an entrance quickly invade the flesh of the apple and turn it rotten—forming the so-called "ripe rots" of stored fruit. Fig. 9 shows apples which are beginning to rot at the "scabby" places on the skin; in the figure to the left the "rot" is commencing round the uppermost "black spot" or "scab"—which is now turned white through the growth of the "mould" which has attacked the apple at this spot; in the apple to the right the "rot" has proceeded further, as is shown by the sunken area now existing round the place (originally a "black spot" or "scab") where the "mould" has gained an entrance. In past seasons I have seen in more than one orchard in Kent "scabby" apples being thus attacked even when hanging on the trees.

Remedies.—Apple "scab" can be easily and cheaply controlled by systematic spraying with Bordeaux mixture. The first application should be made on the young unfolding leaves *just before the blossoms open*. This is a very necessary operation, as I have repeatedly seen, at the time when the apple blossom is out and when consequently no spraying can be done with safety, the "scab" fungus beginning to spread over the surface of the young leaves and forming spores ready to infect the young fruit as soon as it is set.

The second spraying should be given *directly the blossom has fallen*. This will protect all the leaves as soon as possible after they have unfolded.

A third spraying should be given two or three weeks later

in the case of trees where the disease has been very prevalent.

The Bordeaux mixture should be made according to the following formula and in the following manner :—

Copper sulphate ("bluestone")*	...	...	4 lb.
Quicklime	...	...	4 lb.
Water	...	...	50 gallons.

Dissolve the 4 lb. of copper sulphate in a wooden tub or pail ; *iron or tin vessels must not be used*. The easiest way to do this is to suspend the material, wrapped up in a piece of coarse sacking, in a few gallons of cold water, from a stick

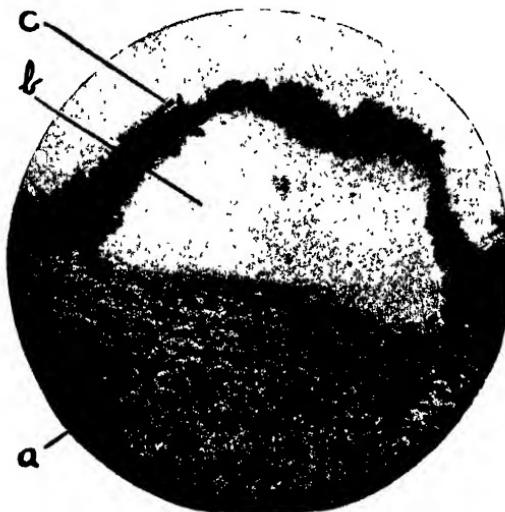


FIG. 8.—Microphotograph of a section of the "scab" infested twig of Cox's Orange Pippin shown in Fig. 6 (A) :—(a), cells of the wood ; (b), cushion-like mass of fungus-tissue, which has pushed its way out through the bark, and produced over its free surface myriads of spores (c). Highly magnified.

placed across the top of the tub or wooden pail. If this is done overnight, the copper sulphate will be found to be dissolved in the water by the morning. If hot water is used, the copper sulphate, especially if powdered, can be dissolved in a few minutes. Then add water to make 25 gallons. Now take the 4 lb. of quicklime and put it in a tin pail. Add a few pints of water until all the lime is slaked, taking care to add only a little water at first ; in this way a thick creamy

* In purchasing copper sulphate an article of 98 per cent. purity should be demanded ; substances described as "agricultural bluestone," often adulterated with iron sulphate, must be avoided.

paste is obtained. Add water to make 25 gallons. We have now 25 gallons of copper sulphate solution and 25 gallons of lime milk. When the two substances are thus diluted with water, they can be mixed together by pouring one into the other, or pailfuls of each can be poured simultaneously or alternately into a third tub, a wooden bucket being used for the copper sulphate solution. It is well to strain the lime milk before the mixing. In this way we obtain 50 gallons of Bordeaux mixture of the best quality.

Two points are of primary importance in making Bordeaux mixture. The first is that quicklime, as freshly burnt as possible, is used. Powdered air-slaked lime, such as is often found in builder's yards, will not make Bordeaux mixture. The second point to observe is that the two constituents, viz., copper sulphate and lime, are diluted with water as much as possible (consistent with the formula) before being mixed. If *concentrated* solutions of copper sulphate and lime are mixed together, and water then added to make up the 50 gallons, the resulting Bordeaux mixture will be of a very inferior quality.

Bordeaux mixture is fully efficacious only when freshly made, and will not keep more than a day or two. If more than a day old it requires to be very thoroughly and constantly stirred while being used, and the use of only freshly-made Bordeaux mixture is far more economical in the long run and is strongly recommended. If a considerable quantity of Bordeaux mixture is intended to be used, the making of *stock solutions* of copper sulphate and lime, which can be kept through the spraying season and used when wanted, saves both time and labour, and is free from all objection. The stock solutions are made as follows:—Take two 50-gallon barrels. In one dissolve 50 lb. of copper sulphate in 50 gallons of water. In the other slake 50 lb. of lime by the gradual addition of a little water; to the creamy paste thus obtained add water to make 50 gallons. These stock solutions will keep for months. Before being used, the contents of each tub must be thoroughly stirred, then each gallon of water which is taken out will be equivalent respectively to 1 lb. of copper sulphate or 1 lb. of lime. The necessary quantity of stock solution is then diluted with water according to the

requirement of the formula given above, before being mixed. The "stock" copper sulphate solution must be measured out in a copper or wooden receptacle.

Only freshly-mixed home-made Bordeaux mixture should be used. The various "dry Bordeaux mixtures" put on the market are not nearly so efficacious and should be avoided.

A simple and reliable test as to whether the Bordeaux mixture when made is safe to use as a spray on leaves and fruit is obtained by the immersion in the fluid, for at least one minute, of a bright blade of a knife. If at the end of that time the surface of the blade is unchanged in appearance the mixture is perfectly safe to use; if, however, the surface

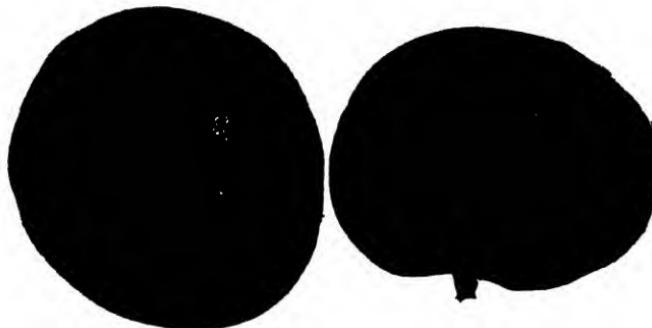


FIG 9.—Rot of Apples, caused by various "moulds" (appearing as white spots in the photograph) which have gained an entrance through the skin of the apple at the places where apple scab or "black spot" have occurred.

of the blade becomes the colour of copper plate, the mixture is unsafe to use, and more lime milk must be added until it fails to give this reaction.

If an insecticide is required, arsenate of lead* can be added to Bordeaux mixture at the same rate per gallon as when water is used. This addition will keep the leaves safe from the attacks of all caterpillars.

If, as sometimes occurs, an attack of "scab" appears late in the season affecting the half-grown fruit, it is not advisable to spray them with Bordeaux mixture, as the fruit when ripe would be marked with the bluish spots of the mixture. These markings, unless they were washed off, would probably affect the market value, although the slight trace of copper

* Arsenate of lead is best obtained in the paste form.

present would be of no danger to the public health. In such cases the fruit may be sprayed with the following fungicide :—

Copper carbonate	...	...	...	...	5 ozs.
Strong ammonia	...	...	...	...	2 to 3 pints.
Water	...	...	...	...	50 gallons.

Dilute the ammonia with about 2 gallons of water. Place the copper sulphate in a wooden or earthenware receptacle, and pour on a little of the diluted ammonia ; stir vigorously, allow it to settle, and then pour off the solution into another similar receptacle, leaving the undissolved portion behind. Repeat this operation until all the copper carbonate is dissolved, using only as much of the diluted ammonia as is necessary to complete the solution. Then add water to make up to 50 gallons. A clear light-blue solution will be obtained, which will keep indefinitely. Arsenical washes (arsenate of lead, &c.) cannot be added to this fungicide.

As a rule, however, two or three sprayings with Bordeaux mixture alone will be amply sufficient to keep the fruit clean. The mixture after again straining must be thoroughly applied by a spraying machine provided with a nozzle which gives a fine misty spray. Enough spray should be applied to make the surface of the leaves uniformly wet, but spraying should cease before the leaves begin to drip. If Bordeaux mixture (made as described above) is applied in a fine misty spray it will be found to adhere perfectly, and will not be washed off by rain for many weeks. There is no need to add any sticky substance such as treacle, and no advantage is gained by doing so.

If the young wood has become severely attacked, as much as possible of it should be cut out in pruning. Then the trees should be sprayed in winter while the wood is dormant with the following winter wash :—

Copper sulphate ("bluestone")	...	...	...	...	2 lb.
Water	...	...	...	...	50 lb.

This winter-wash is fully strong enough to kill the parts of the fungus with which it comes into contact, and there is no advantage gained in using a stronger wash.

Certain varieties of apples are specially susceptible to apple "scab," and such varieties should be looked over carefully and special attention paid to keeping them clean.

Among the most susceptible varieties are the following :— King of the Pippins, Cox's Pomona, Lord Grosvenor, Suffield, Wellington, Ecklinville Seedling, Northern Greening, Yellow Ingestre or Summer Pippin and (mainly as regards the leaves) Bismarck.

Among specially *resistant* varieties may be mentioned :— Beauty of Bath, Bramley's Seedling, Newton Wonder, Grenadier, Lord Derby, Lane's Prince Albert, Queen, The Victorian, Golden Spire.

In conclusion I should like to direct the earnest attention of English fruit-growers to the fact now definitely proved that apple "scab" or "black spot" can be perfectly controlled by means of Bordeaux mixture. Orchards and plantations which have been producing annually "scabby" apples can at a slight cost be made to yield crops entirely free from the disease.

THE BROWN SCALE OF THE GOOSEBERRY AND CurrANT.

ROBERT NEWSTEAD, A.L.S.

School of Tropical Medicine, University of Liverpool.

This insect (*Lecanium persicae*, var. *ribis** Fitch) is found in great abundance on the gooseberry, currant, rose, plum and cotoneaster, but rarely on raspberry ; and it has also been found on a variety of other cultivated and wild plants.

It has a decided preference for the older branches, the young shoots being attacked only when the insects become over-crowded.

It is very generally distributed throughout England, but is less known in Wales, Scotland, and Ireland. Outside the British Isles it is found in abundance in Germany, France, and Bohemia, and has occurred in some numbers in New Zealand and Australia. If it can be proved that Fitch's type is the same as the European forms, then it occurs also in North America, into which country it may, in all probability, have been introduced on imported plants.

It is as a rule much more prolific on plants grown

* This specific name is the one by which this insect is most generally known to scientists and horticulturists in this country ; and it would be well if it could be retained, as it is a much more appropriate one than *sarothamni*, which was given to it by Douglas in 1891.

in sheltered spots, especially on wall-trained trees in a fairly sunny aspect, and no plant suffers in such situations so much as the cotoneaster.

There can be no doubt that this insect is a mere phytophagous variety of the peach scale (*L. persicae*), differing only by its usually smaller size, its more rotund or hemispherical form, and the more marked character of the blackish, transverse bands in the immature stage. Apart from these exceptions the description of the one serves equally for the other, and the methods of control herein described will serve equally well for both kinds.

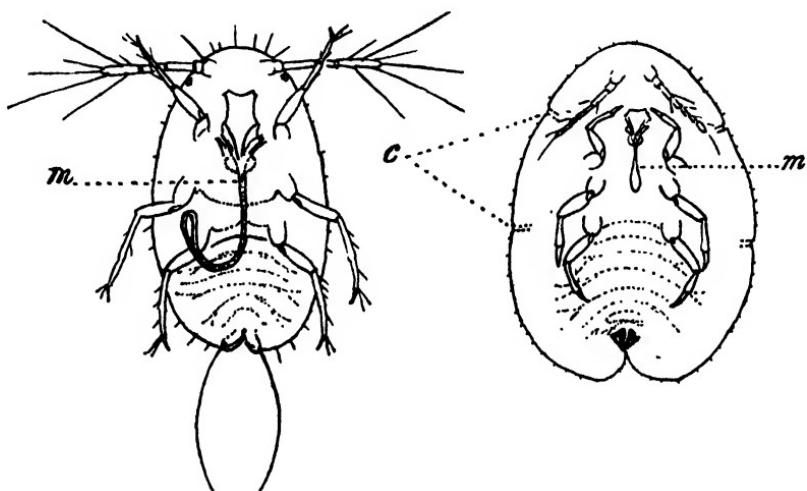


FIG. 1.—Larva magnified about 50 diameters. (m.), mouthparts.

FIG. 2.—Underside of young female magnified about 15 diameters. (c), channels leading to respiratory tubes (stigmata). (m.), mouthparts.

Description and Life History.—The young gravid female (Fig. 2) is short and ovate in form, being a little longer than it is broad, flat beneath and highly convex above. The colour of its upper parts varies from dusky ochreous-yellow to greenish yellow, with eight or nine more or less interrupted, blackish, transverse bands, of which the anterior one is the broadest, the rest diminishing in width as they approach the hinder or cleft extremity of the body. The legs and antennæ are retained, but the insect loses all power of locomotion long before the period of gestation commences. As the insect matures the pale colour gradually changes to bright chestnut

brown or ochreous brown. At this stage the integument becomes hard and brittle and bears a number of transverse wrinkles at the sides. The female begins to lay her eggs while the body is yet soft and tumid; and as the process develops the ventral surface of the insect shrinks until it finally reaches the under surface of the outer hardened skin, so that a relatively large cavity is formed beneath the insect which is filled with hundreds of whitish translucent eggs. At this stage the insect dies and her dead body (Figs. 3-5).



FIGS. 3-5.—The Gooseberry Scale (*Lecanium ribis*) on rose (Fig. 3), on plum (Fig. 4) and on peach (Fig. 5). All natural size *in situ* on the food plants.

the so-called "scale," forms a protection for the eggs, and for a short period also for the young larvæ or "lice." The young escape from beneath the parent chiefly through the little slit or cleft at the posterior extremity, leaving behind them the effete, white, egg shells and a little white mealy secretion. The young larvæ (Fig. 1) are quite minute, about the size of a large cheese mite, which they somewhat resemble, except that they possess but three pairs of legs, have rather long antennæ, and two long bristles at the end of the abdomen. They are active for a short time, but soon

become inert. The mouth parts (Fig. 1 *m*) consist of a fleshy lip or labium through which pass the extremely slender hair-like mandibles and maxillæ with which the insect pierces the bark and through which it sucks up the juices of the plant—collectively therefore these organs form a sucking tube.

The larvæ usually fix themselves under the partly detached or curled up portions of the bark so that they are often completely hidden, and in this way pass the winter without any material change. They are then of a reddish brown colour and so small that at first sight they may be easily mistaken for the stomata of the plant. In spring they cast their skins, and may become active for a short period: in June they become adults and the cycle commences again. The old "scales" or dead females may, if undisturbed, remain attached to the host plant for a very long period—two or three years in some instances; it often happens therefore, that the representatives of two or three generations may occur on the plant at the same time.

The scale insects indigenous to this country are, so far as I have been able to gather, single brooded, but ovulation may sometimes be retarded by the influence of the weather, and moreover the young larvæ may continue to hatch out for a relatively long period, so that the life cycles are not always clearly defined and there may be a slight overlapping of the stages of development.

It may be interesting to note that the male of this insect has not yet been discovered, and there can be no doubt that the females are able to reproduce their species without the intervention of the opposite sex. This remarkable trait is, however, quite common among scale insects and some of the plant lice.

Remedies and Methods of Control.—Spraying in the early part of February with either of the washes mentioned below is the only practical means by which this pest can be controlled or destroyed. At the same time it should be borne in mind that it is the larvæ or young insects which are found living during the winter months; and as they are quite minute and often protected by the semi-detached bark, the spraying must be thorough or the result will not be satisfactory. Care must also be taken to see that the under sides of the branches

are well sprayed as the insects are usually more abundant in such situations than on the exposed and more accessible portions of the bushes. It is also advisable to complete the pruning before spraying operations are commenced; and in the case of old and badly infested plants it is desirable to remove as much of the old wood as is practicable. The spraying apparatus should have the nozzle fitted at an angle of about 45 degrees so that the spray may be conveniently directed to the under sides of the branches. In the case of the gooseberry, "sponging" or "brushing" is practically impossible owing to the spinose character of the branches.

(1) *Caustic Soda Wash.**

Sulphate of iron	...	...	...	...	...	$\frac{1}{2}$ lb.
Lime	...	...	...	...	...	$\frac{1}{4}$ "
Caustic soda	...	...	...	...	...	2 "
Paraffin	...	...	...	...	...	5 pints.
Water to make 10 gallons.						

The wash should be prepared as follows:—(a) Dissolve the iron sulphate in about 9 gallons of water. (b) Shake the lime in a little water and then add a little more water to make it into a milk. (c) Run "b" into "a" through a piece of coarse sacking to keep back grit. (d) Churn the paraffin into the mixture. (e) Add the caustic soda in the powdered condition. It is not wise to add the caustic soda till just before using.

(2) *Paraffin-Soda Wash.*

Caustic soda	...	...	..	...	..	2 lb.
Soft soap	...	..	...	..	..	$\frac{1}{2}$ "
Paraffin	...	...	.	...	...	5 pints.
Water	...	...	...	...	...	10 gallons.

Dissolve the soft soap in a gallon of boiling water. Add the paraffin while the soft soap solution is still boiling hot, and churn thoroughly until an emulsion is obtained. Dissolve the caustic soda in the rest of the water, just before using, and then pour it into the paraffin emulsion, mixing well, and using at once.

Rubber gloves should be worn by the sprayer as a protection against the effects of the caustic soda, and goggles fitted with a piece of rubber sheeting or waterproof of some kind are an excellent safeguard for the eyes and face.

* Leaflet No. 70. Board of Agriculture and Fisheries. This is the spray known as the "Woburn Wash." See Woburn Experimental Fruit Farm report for 1906.

Moths.—Inquiries as to the caterpillars of the winter moths (Leaflet No. 4) were received from Colnbrook, Slough, where both top and bottom fruit were stated to be much damaged, and from Cambridge, and Other Pests.* gooseberry and plum trees being badly attacked in that county. It should be noted that the caterpillars not only infest taller orchard trees like plum, cherry, apple and pear, but frequently pass to the lower fruit bushes under orchard trees. It is necessary to emphasize the importance of winter spraying in late January or early February in the manner recommended in Leaflet No. 70. Banding the trees at the proper season, as described in Leaflet No. 4, should be practised. Where the caterpillars are in evidence spraying with arsenate of lead in the paste form will poison the food of the caterpillars and thus destroy them, as indeed many other forms of leaf-eating insects.

Larvæ of the magpie moth (Leaflet No. 20) were received from St. Mabyn, Cornwall, where they were damaging gooseberry bushes. Larvæ of the raspberry moth (Leaflet No. 14) were received from Meigle.

Flies.—A fly received from Carmarthen was found to be a specimen of *Eristalis tenax*, the Drone fly. This insect is not injurious to fruit trees or plants, and it may be useful in promoting pollination. The eggs of the *Eristalis* flies are laid in water containing decaying organic matter, or in putrescent carcases which have been allowed to lie until putrefaction reaches a liquid stage. The maggots are aquatic in their habits.

Specimens of leather-jackets, or the larvæ of daddy-longlegs (Leaflet No. 11), were received from Broughton-in-Furness, where they are stated to have done hundreds of pounds worth of damage, acres of oats in South Cumberland and North Lancashire having been destroyed. Spring oats have also been seriously damaged on many farms near Helston, Cornwall, re-seeding having been necessary in some cases; winter wheat is also patchy. A correspondent writing from Plymouth stated that he had lost several acres of oats from the same cause, and feared he would lose more.

* Notes on insect, fungus and other pests, dealing with the specimens submitted to the Board for identification, and their apparent prevalence, will appear in this *Journal* month by month. The notes commenced with the issue for June, 1907.

Beetles.—Specimens of cabbages with swollen roots were found to be infested with the larvæ of a small beetle, *Ceutorhynchus sulcicollis*. The beetles feed in the flower heads and the grubs on the roots, on which they give rise to swellings or galls. The larvæ are small white grubs, and may be found on carefully opening the galls. This pest, known as the turnip gall weevil, is a serious enemy of cruciferous crops, such as turnips and swedes, while it also attacks cruciferous weeds, having been found in abundance on charlock. The importance of this fact in relation to the rotation of crops and to the destruction of weeds should be noted.

When cabbages have been destroyed by the attack of this pest, it is important that the stumps should be removed *and burnt* before the grubs leave the galls and pass into the soil. Such a measure may prevent a fresh attack. A dressing of gas lime, spread on the surface and allowed to lie for a month to five weeks before ploughing in, has been found useful.

Where the pest occurs in gardens, the soil should be deeply dug after an attack, so that the grubs, or pupæ, which would develop into the adults of a new brood, are buried so deeply that the beetles, even if developed, cannot reach the surface.

Earwigs.—The Board have received several complaints of damage done by earwigs, the latest being from Gerrard's Cross, Bucks. Earwigs are at intervals reported as occurring in immense numbers, while they are frequently an unmitigated nuisance in houses. Full details of the life-history of earwigs are still lacking, but the females are believed to lay their eggs in holes in the soil, amongst rubbish and generally in hiding places which are likely to remain undisturbed. The eggs of a single female are laid all together in a heap, but there are no nests or collections of individuals as in the case of bees, wasps or ants. It is known that the eggs of at least one species are laid in March, and the young from these eggs are adult by the end of May.

Earwigs are fond of crevices and other hiding places, and nearly all remedial measures take advantage of this habit. In gardens, flower pots containing hay or tissue paper or moss are placed upside down on the top of sticks, and in fields old weed baskets stuffed with hay or straw and left here and there inverted on the ground, or bags hung on stakes, have been

successfully used as traps. Such traps should be regularly visited and the earwigs in them shaken on to a tarred board so that they may not escape, or into a vessel containing paraffin. Small heaps of straw may also be placed here and there, the heaps, with the sheltering earwigs, being fired on a quiet night.

Where the pests are in overwhelming numbers trapping may seem a tedious measure, but many thousands have been caught in this way. The earlier in the season it is done the better, new broods being more certainly prevented.

Cracks and crevices in walls are favourite shelter places for earwigs. Walls should therefore be well pointed, and any cracks should have paraffin syringed into them. Rubbish and old bark, &c., should be destroyed.

Aphides.—Specimens of larch shoots were received from Wellington, Salop, and were found to be covered with Larch Aphides. Had these been observed earlier, they could have been dealt with more effectively. During the hibernating stages, and while the trees are in their winter dormant condition, the following spray fluid has proved very successful :—3 lb. of soft soap, dissolved in 2 quarts of boiling water ; to this 1 pint of paraffin should be added while still boiling hot, and the two churned together until a buttery mass has been formed. For use this emulsion should be diluted with 5 gallons of soft water.

Such a wash would be too strong for use when the delicate young leaves are beginning to show, but a more dilute emulsion might be used with success. Treatment should take place as soon as possible after an infestation is observed, before a new generation has had time to add to the numbers.

Cinerarias from Aberdeen were found to be suffering from a bad attack of greenfly, a pest to which cinerarias are particularly subject. A white velvety coating of fungus mycelium was saprophytic on the honey-dew secreted by the aphides.

Beech Coccus.—Several cases of beech coccus were reported. A fuller report on this pest is being prepared, and a statement will be made in a subsequent issue.

Springtails.—Some specimens of insects sent from near Totnes, Devon, and stated to be seriously injuring oats, were found to be springtails or *Collembola*. The species could not be definitely determined, as the specimens had lost the "springs,"

a necessary mark in the determination of the species of *Collembola*. They belonged, however, to the genus *Tomocerus*, a genus which contains a species known to be injurious to plants, and causing a yellowing of the leaves. To damage crops of oats or mangolds they would need to be present in great numbers. (See also *Journal*, December, 1907, p. 557.)

Mites.—Bulbs from March, Isle of Ely, were found to be infested with bulb mites, which appear to be doing much damage in that district. The bulb mite is dealt with in Leaflet No. 136. Black currant specimens from Andover were attacked by the black currant mite (Leaflet No. 1).

Eelworms.—Sweet peas from York were infested by eelworms, which are dealt with in Leaflet No. 46. Sulphate of potash at the rate of 4 cwt. per acre (about $\frac{1}{4}$ oz. per dozen 5-in. pots) has been experimentally found to destroy eelworms.

Fungi.—Specimens of imported gooseberries from Birmingham market were forwarded to the Board on suspicion that they were infected with American gooseberry mildew. They proved, however, to be covered merely with the saprophytic fungi (*Penicillium*, *Mucor*, &c.), met with on all bruised fruit.

Anemones from Penryn were attacked by the Rust *Aecidium punctatum*, Pers. The fungus is perennial, the mycelium remaining in the root-stock and infecting the new leaves each season. The most satisfactory course to pursue is to remove and burn all affected plants, as these rarely, if ever, produce flowers.

Specimens of peach from Ilminster were affected with *Exoascus deformans*, Fckl. (Leaflet No. 120); apple branches from near Worcester were injured by an incipient stage of apple tree canker (Leaflet No. 56), little fruit being formed on the diseased patches. Specimens of apple trees attacked by apple scab (Leaflet No. 131) were received from Chichester and Oakham.

The roots of young peas from Chertsey were attacked by the fungus *Thielavia basicola*, Zopf. This disease spreads very rapidly under favourable weather conditions, and is very difficult to arrest when seedlings are attacked. Watering with a solution of sulphate of potash tends to check the spread of the mycelium in the soil, while a sprinkling of soot is also of service.

Abnormal Growth of Plants.—Celery plants which were submitted for examination from Cardiff exhibited no signs of insect or fungus attack, but showed a precocious branching of the tap root. A similar appearance has been observed in the case of seedlings damping off owing to the presence of excessive moisture in the soil.

Geranium leaves from Limpsfield, Surrey, were free from disease, but had assumed a crinkled appearance, probably owing to an error in culture. If repotted in loam mixed with silver sand they would probably grow normally.

Tomato plants at Blackburn were found to have gone "blind." This blindness is not the outcome of injury caused by a fungus or insect, but is usually due to over-feeding and a "rushing" mode of growth.

In the case of strawberry blossoms received from Morecambe the central portion had shrivelled and turned black. This was due to the fact that they had not been fertilised,

Blossoms from a six-year-old Black Tartarian cherry tree were received from Stroud, Glos., during May. The tree is stated to bloom profusely every year, but fails to set fruit, even under the most favourable weather conditions. It appears possible that many varieties, and even particular individual fruit trees, pears, cherries, &c., are quite incapable of setting fruit when limited to their own pollen. When a tree which has blossomed well has failed to fruit for some years without other apparent reason, it is highly probable that the failure is due to lack of cross pollination. To secure cross-pollination the pollen should be produced by a tree of a distinct horticultural variety, and not from another tree of the same grafted variety as the sterile tree. This end is gained by planting mixed orchards in place of blocks of one variety, unless experience has proved the variety to be perfectly self-fertile. In a case such as that recorded a second cherry tree of another variety might well be planted in proximity to the sterile tree. Cases are known where it was necessary to do something like this in India.

Two diseases of the potato have been very rife in Germany during the past year, and much anxiety is felt as to the next

Potato Leaf Curl in Germany. crop, owing to the deficiency of sound seed. The diseases in question are "*Ringkrankheit*" and "*Blattrollkrankheit*," apparently the disease known in this

country as Potato Leaf-Curl (Leaflet 164), both of which affect the tuber. Potato Leaf Curl is very common in England, and "*Ringkrankheit*" or "*Ring disease*" is also found in potatoes in this country. A note on the latter occurs in the *Journal* for December, 1902, p. 308. Count Arnim-Schlagenthin, in an article in *Fuhlings Land. Zeitung* (1st Feb. 1908), states that about 400 samples of potato, collected from all parts of Germany, have been examined in his laboratory, and proved without exception to be badly diseased, and he concludes that these diseases, which were originally limited to certain districts and certain sorts, have now attacked practically all kinds all over Germany. He considers that owing to the short crop of 1907, farmers are likely to be compelled to use diseased seed, so that an increasingly severe attack is to be expected in the current year's growth. On these grounds, Count Arnim regards it as important that investigations should be undertaken to ascertain the actual extent of the disease and also to discover a disease-resistant sort.

In the view of some authorities, however, Count Arnim has over-estimated the danger to the industry, and the Hohenheim Experiment Station has made an investigation into conditions in Wurtemberg, and it is considered that so far as Wurtemberg is concerned the crop is not seriously threatened, although precautions are necessary. (*Wurttembergisches Wochen. für Landw.*, 21st March, 1908.)

On the other hand, at a meeting of the German Agricultural Society in February, Dr. Appel, a recognised authority on the subject, stated that the advice to counteract the disease (potato leaf-curl) by the employment of sound seed could hardly be followed this year as seed completely free from disease could scarcely be procured in large quantities. This Society has since issued a warning notice to farmers, urging them as far as possible to avoid planting potatoes affected with leaf-curl.

It is observed that though this disease has not been fully investigated and is difficult to determine, its existence is indicated by dark specks or streaks under the eyes of the tuber, which can be seen by cutting the potato across; everyone should examine his seed by cutting a considerable number of tubers, say 100 of each sort. As the disease diminishes the size of the tuber, it might perhaps be restrained by the selection of large potatoes for seed.

The Society passed a resolution, proposed by Count Arним, urging the Imperial Government to provide the Agricultural Biological Institute with means to carry out an experimental investigation into potato leaf-curl. (*Mitt. Deut. Landw. Gesell.* 22nd Feb., 1908.)

If the German *Blattrollkrankheit* is the same as potato-leaf-curl, the proper remedy would seem to be change of "seed." The experience of English growers shows that potatoes grown from Scotch seed are free from curl, and that the disease does not become serious until three, or sometimes four, years after the change.

The twelfth report of the Royal Commission on Horse Breeding (Cd. 4039. Price, 3d.) contains an account of the premiums offered since the date of the

Report of the Royal Commission on Horse Breeding. previous report in 1907, together with a *résumé* of the work and proceedings of the Royal Commission since its first inception, and of the course which was pursued by the Commissioners in relation to the Conference which was summoned by the President of the Board of Agriculture.

In summarizing the results of the work accomplished since the Commission was appointed in 1887, it is pointed out that 583 stallions have been awarded premiums under the direction of the Commission. By these premium winners, there were served up to the end of 1907, 30,836 mares, of whom, after allowing for 2,433 mares of which no returns were received, an average of 58 per cent., or, in round numbers, 14,250, were left in foal. The returns of mares left in foal for 1907 and 1908 are not yet forthcoming, but applying the average annual production of foals to those two years, it

would show since the premiums were first awarded in 1888, an average annual production of 783 foals.

This number of foals is, of course, but a trifling addition to our stock, compared with the requirements of the country, but it must not be forgotten (firstly) that they are all of them the produce of perfectly sound horses; (secondly) that for some years past their success in winning prizes for young stock at the leading shows in the United Kingdom has been conspicuous; and (thirdly) that during 1907 the descendants of these horses were winners of no less than 489 prizes.

The Commissioners add that they are well aware that the work of the Commission has been freely criticised, and numerous suggestions have been made for a different distribution of its funds, which the Commissioners have carefully considered, but its main and primary duty being to encourage the breeding and maintenance of a race of sound horses, it is permissible, they think, to doubt whether their extremely limited means could have been used to better advantage for the purpose of the special duty which had been entrusted to them.

The Commissioners call special attention to the following paragraphs in a memorandum of conclusions which was submitted to the Board of Agriculture:—

"We think that the 28 King's premium stallions which are allowed for Great Britain are wholly insufficient for the wants of the country. We note the great use made in some districts, not only of unsound, weedy, thoroughbred stallions, seldom if ever exhibited, but also of inferior mongrel half-bred stallions, of bad quality. We regret the continual purchase by Foreign Governments of many of our best stallions, and we think that measures should be taken to counteract this evil which has been so appropriately referred to by the Royal Commission.

"The deterioration has steadily increased since this representation was made, and improvement is unlikely with the growth of the motor and tramway systems. We think that the Irish plan of providing funds to associations or individuals for the purchase of stallions in certain districts, with a provision for repayment by instalments, ought to be developed in Great Britain as supplementary to the system of King's premiums. Stallions should, as has been the case in Ireland, be eligible for prizes varying from £5 to £25, for the points gained by their stock exhibited at shows approved by the Department of Agriculture.

"We do not think, however, that the Irish plan will be sufficient in itself, or that it would prevent Foreign Governments from continuing to get the best of our thoroughbred stallions, adapted for country purposes.

"Something more than that is needed when, as in this case, we have to compete with the resources of Foreign Governments for their possession.

"We consider it essential, for the real and permanent improvement of the breeds, that the majority of these horses which now go abroad should be secured for use in the United Kingdom.

“But if they are to remain in the country it can only be by the aid and the resources of the Government at home, in view of the competition for their possession, by various Governments abroad, and we think that arrangements for their purchase and care should be made with the assistance of the Government, and that these arrangements should be under the control of some central authority, either the Royal Commission or some other body appointed by the Government for that purpose.

“In order to re-stock the country with suitable registered mares, we recommend the adoption of the system initiated by the Brood Mare Society which is described in their Report, and that the machinery of that Society be made available by constituting it the agent of the Royal Commission.” (The rules proposed by the Society for the purchase, custody, and distribution of mares and their stock, if appointed agents, are attached to the Report.)

The Commissioners think that these conclusions should be most carefully considered in connection with any scheme which may be formulated for the purpose of improving the breed of horses in the United Kingdom.

In connection with the losses which have arisen from the disease known as “struck” in sheep in the Romney Marsh district, the Board wish to draw attention

**“Struck”
in Sheep.** to the danger arising from the practice of skinning the carcases of “struck” sheep on the pastures and leaving them there

unburied. It must be remembered that this disease is contracted from spores present in the soil, and as the muscle-juices and other fluids of animals which have died of this disease contain a plentiful supply of the causal microbe, the practice of skinning carcases and leaving them to exude their juices must add to the contamination of the soil and doubtless furthers the distribution of infection. In a district such as Romney Marsh the probability is that the soil is already in a badly infected condition, so that it is very desirable that such a practice should be discontinued and every precaution taken to prevent further infection.

The persistent character of the virus was shown in an experiment made some years ago by Mr. Stockman, the Board’s Chief Veterinary Officer. A considerable quantity of soil was sterilized at a very high temperature and placed in large porous pots. The diluted muscle juices of an animal, which had died of the disease, was then poured over this soil and it was found possible, many months afterwards, to produce the disease in other animals by inoculating them with washings from the soil so treated.

In view of the established fact that one of the chief sources of the disease is soil contamination, the importance of destroying the carcases of diseased sheep, by cremation if possible, cannot be too strongly emphasized.

In this connection, attention may be drawn to section 6 of the Dogs Act, 1906, which provides that any person who shall knowingly and without reasonable excuse permit the carcase of any head of cattle (including horses, mules, asses, sheep, goats or swine) belonging to him to remain unburied in a field or other place to which dogs can gain access shall be liable on conviction under the Summary Jurisdiction Acts to a fine not exceeding 40s.

An account of the disease known as Quarter Ill, Quarter Evil, or Black Leg, which are synonymous terms with "Struck" and Black Quarter, is given in Leaflet No. 102, copies of which may be obtained, post free, from the Offices of the Board.

The milk-testing scheme of the Board, whereby farmers who wish to ascertain the percentage of butter fat in the milk yielded by their cows can send samples

Number of Milk Tests made in 1907. 6d. a sample, has now been in work for

two complete years, and the results shown are on the whole satisfactory. The number of samples submitted in some districts has increased, and there is evidence that the advantages afforded by the scheme are becoming appreciated. It must, however, be admitted that the progress is by no means uniform, that very little advantage is taken of the facilities offered in some parts of Great Britain, and that the persons for whom it is intended are not those who make most use of it.

Out of the 20 samples sent to the Marischal College, Aberdeen, 13 came from Ross and 7 from the county of Aberdeen, none of the other counties in the North of Scotland supplying any samples. Eight of these 20 samples came from the representative of a large and wealthy proprietor, but the smaller milk producers, who would probably benefit by the system, made very little use of it. Out of the 98 samples sent to the Edinburgh and East of Scotland

College, 27 came from one person and 11 from another. It must be remembered that the district served by this college is only to a comparatively small extent engaged in the dairying industry. The West of Scotland Agricultural College makes no charge for the tests, and the number of samples is large. One farmer, who sent in no less than 300, had the whole of his cows tested regularly during the whole season. The farmers in the districts served by the Armstrong College and the Agricultural Department of Leeds University have not taken much advantage of the scheme, the former college receiving only 9 samples from 3 persons and the latter 52 samples from 18 persons, of which 30 samples came from 3 persons in the North Riding and 22 from 15 persons in the West Riding. No samples were sent in from the East Riding.

No less than 95 tests were made at the Midland Agricultural and Dairy College, the samples being sent from Notts, 35; Derbyshire, 14; Leicestershire, 14; and Lincolnshire (Lindsey), 1; while 25 samples were sent from places outside the counties that contribute to the support of the college. Of these 9 came from Liverpool, 3 from Malmesbury, 3 from London, 8 from Stafford, 1 from Bristol, 1 from Coventry, 1 from Hants, 1 from Stourbridge, and 1 from the borough of Leicester. In many cases the source of these samples was not disclosed, but, with the exception of 8 samples taken from the milk of individual cows, they probably came from the milk of herds of varying size. One sample from a single cow gave 2.1 per cent. of fat. Ten samples of mixed milk fell below 3 per cent. of fat. They were chiefly taken from the mixed milk of cows whose time of milking was uneven. In one case, where the times of milking were 5.30 A.M. and 2 P.M., the morning's milk contained only 2.7 per cent. of fat. The farmers of Staffordshire and Shropshire sent in 110 samples of milk, while 224 were tested for experimental purposes, and some remarkable results were obtained. The highest percentage of fat in the morning's milk was 5.20 and in the evening milk 7.20, and the lowest 2.50 and 3.10 respectively. These were drawn from the mixed milk of herds. The number of samples sent to the Essex County Laboratories shows a great increase, 577 samples being sent from Essex and 89 from Hertfordshire in 1907, as compared with 320 from Essex and 77 from Hertfordshire in

1906. A similar satisfactory result is recorded at Wye, where 248 samples were received, as compared with 125 in 1906, 220 of which came from Kent and 28 from Surrey. Of these no less than 104 were sent in between July and December by one farmer, evidently for the purpose of improving his herd. The effort appears to have been attended with success, for in time almost all the samples were well above the 3 per cent. limit. The result appears to be directly attributable to the regularity with which the milk was tested, and illustrates the advantages of the system so often urged by the Board.

The number of samples tested at the different institutions was as follows :—

Name of College.	Number of Persons Sending in Samples.	Number of Samples.	Milk of Single Cows.	Mixed Milk of Herd.
University College of North Wales, Bangor	...	9	...	...
University of Leeds	18	52	...	...
Armstrong College, Newcastle-upon-Tyne	3	9	...	...
University College of Wales, Aberystwyth
Cambridge University	...	6	...	...
University College, Reading	50	202	...	...
South-Eastern Agricultural College, Wye	44	248	...	...
Midland Agricultural and Dairy College	...	95	8	87
Harper Adams Agricultural College	...	110	...	...
College of Agriculture and Horticulture, Holmes Chapel
Agricultural and Horticultural College, Uckfield	...	39	...	...
Essex County Technical Laboratories	...	666	...	...
Eastern Counties Dairy Institute, Ipswich	...	102	...	...
Cumberland and Westmorland Farm School
County Council Dairy School, Gloucester	...	24	...	...
Shepton Mallet Grammar School	...	152	...	...
Glasgow and West of Scotland College	...	433	...	...
Marischal College, Aberdeen	...	20	...	...
Edinburgh and East of Scotland College of Agriculture	...	98	...	...
University College, Cardiff	...	60	9	51

The following suggestions have been received from the officers who carried out the tests. Commenting on the comparatively small number of samples sent, one writer says :—" I think that the supposed difficulty of sending a glass bottle by post is one of the reasons for our not getting more samples. I have met with several cases where a farmer will drive many miles rather than pack up the bottle to go by post. We very often have

farm hands sent half-a-day's journey on foot with a sample. The samples that arrive through the post, broken or unbroken, show no lack of originality in packing or in choice of bottles. If some enterprising firm would make and advertise bottles for milk samples, packed in light boxes ready for post, I think it might help things a little."

Another writer says :—" A small number of samples undoubtedly genuine have fallen below the limit, the cause for which I am disposed to attribute very largely to defective sampling. This is a question of the highest importance, and yet both farmer and retailer have failed fully to appreciate it."

A far more serious difficulty, however, is that the tests are often used by persons for whom they were not intended, or, even if used by the proper persons they are used in an improper way. One writer points out that they are used by retail milk sellers in all probability for the purpose of seeing how much water can be added without detection.

This, of course, can be obviated by refusing to test samples which are sent in without the particulars required on one of the forms provided by the Board, particulars which can only be supplied by the milk producer. Another difficulty is that farmers seem to look at these tests from a wrong point of view. One writer says :—" I seldom seem to get samples sent unless the producer is in trouble. Instead of making use of the tests to check the quality of the milk produced, they use them in order to check the result of some analyst who has reported against the milk." Another writes :—" The milk in this district is chiefly produced for selling as milk, and all the farmers care about is to get as large a yield of milk as possible without troubling as to the quality. One farmer came and asked us to defend him in the court when he was prosecuted for selling milk with added water, but this, of course, we refused to do." The following method of avoiding this unpleasant experience is given from another centre :—" The recommendation to keep back a little of the first drawn milk from the morning's milking was put into practice in some instances, with the result that the remainder was raised above the standard. The extra labour of drawing a small quantity of milk into a separate pail in the morning is not great and results

in a marked improvement in the quality of the remainder. The plan has been tried with success by several farmers, who were in difficulties owing to the early hour at which they had to milk in the afternoon, and consequent uneven hours of milking."

The following figures have been supplied by the Harper Adams Agricultural College. They are the results of a series of tests made on the milk of a farmer who retails his own milk, and, as pointed out by the writer, "the importance of keeping the milk well stirred during the time of delivery is well demonstrated" :—

				Per Cent. of Fat.
No. 1—				
From the top of the churn	...	...	...	2·70
Drawn from the churn by the tap	...	...	...	2·70
After the morning's delivery	...	...	...	3·70
No. 2—				
From the top of the churn	...	...	...	3·55
From the bottom of the churn	...	...	...	3·40
No. 3—				
From the top of the churn	...	...	...	3·70
From the bottom of the churn	...	...	...	3·10

A suggestion having been made to the Board that the action of the calf in agitating the cow's udder led to the production of more milk, the test was arranged by the Harper Adams Agricultural College, with the following result:—Four cows were taken, as much alike as possible, in respect of lactation period, quantity of milk yielded, &c., but different in this respect, that two were easy milkers and two difficult milkers. At each milking half the milk was weighed and sampled as soon as drawn, and the remaining half was likewise weighed and sampled. Each sample was tested for fat. During the first week the udders of the cows in one lot were agitated after the manner of a calf's action in sucking, while those in the other lot were not agitated. In the second week this procedure was reversed. It was found that there was no increase in the total percentage of fat as compared with the averages of these cows taken from the College herd records, and the conclusion is that the peculiar action of the calf during suckling is to facilitate the flow of milk. The time taken up in agitating the udder is quite compensated for by the ready flow of milk.

The Oxfordshire Agricultural Society at their Abingdon meeting in May last allotted three prizes for a "milk contest." The competition was limited to herds of not

A Milk Contest. less than 10 milking cows belonging to tenant farmers, and containing not more than one cow of a Channel Island breed to every ten of other breeds. The samples were taken from the whole bulk of mixed milk, and the cows were milked in the afternoon in the presence of an official of the Society, by whom the sample was taken. The milk was not to be strained, and no preservatives or other matter added. The samples were analysed and judged at the University College, Reading. Seven competitors entered.

In making the award points were given not only for chemical composition (fat content and amount of solids not fat), but also for cleanliness and amount of milk per cow, allowance being made for period of lactation of the animals. All the samples contained 4 per cent. or over of butter fat and more than 8·5 per cent. of solids not fat. In cleanliness and keeping quality they were all of high merit.

During the *last* week of April (ending the 2nd May) the weather varied greatly. During the greater part of the week it was rainy and cold, but towards the end it

became fine and unusually warm over England. Except in the extreme north of Scotland rainfall was "heavy" ("very heavy" in the Midlands and England N.W. and S.W.). Sunshine was in many places "scanty." During the first week of May the weather was very unsettled and rain frequent. Warmth was "unusual" in most places, and except in England E. and S.E. rainfall was "heavy." Sunshine, however, was uniformly "scanty" ("very scanty" in England S.E. and S.W. and Scotland W.).

**Notes on
the Weather and
Crops in May.** The thermometer did not fall below 42° F. in the daytime in any part of the Kingdom except Scotland F. and N., being above the average in this respect everywhere. In the second week the weather was generally unsettled, with much cloud and more or less rain on several days. Warmth was "deficient" only in England S.E. and S.W., though sunshine was "scanty" in England N.E., E., S.E. and the Midlands. In the last three districts rainfall was also "heavy." In this week the accumulated day degrees below 42° F. was much fewer than usual. During the third week the weather was mostly fair over England and often very sunny, but in the north and west of Scotland rain was frequent. Warmth was "unusual" in England N.E., E. and the Midlands, while sunshine was generally "abundant." Rainfall in the eastern section of the Kingdom was generally "light." There were no accumulated day degrees below 42° F., and the number of degrees in the eastern section above that temperature was above the average. During the last week the weather was generally fine. Except in England S.E., S.W. and the Midlands warmth was "unusual," while rainfall was in many places "light." Sunshine was "abundant" in England N.E., S.E., N.W. and the Midlands. There were no accumulated day degrees below 42° F., and once more the number of degrees above that figure was much above the average.

This concludes the period of spring, calculated according to meteorological records. The long period of severe cold was succeeded by mild and satisfactory weather, and by the end of the period the season had practically caught up the three weeks which had been lost. The rainfall for the spring was well above the average of the last twenty-five years, though the number of hours of sunshine was less.

Reports from Berkshire show that during the first half of the month little progress was made. The land was wet and the season still backward. Towards the middle of the month, however, everything grew at a great pace and farm prospects were good. The end of the month was summer weather. The corn crops looked a little yellow, but the grass was wonderfully good. Fruit was not so good, and gooseberries appeared to have suffered. In North Lancashire the results of the check experienced in April disappeared with the rains in early May, and the progress made by the vegetation was very marked. The lambing season has been variable, some farmers having severe losses. Strawberries and currants show signs of a heavy crop. Bee stocks which suffered from last year's wet weather have benefited considerably by the warmth.

Reports from Midlothian state that more work has been successfully performed on the farms during the week ending the 23rd May than in the previous six weeks. The season at that time was a month late. On the 20th May potatoes were still being planted, and in some places turnips were being sown for the first time. Apricot blossom suffered from the night frosts in the beginning of May, but little other damage is reported. The magpie moth caterpillar has proved extremely destructive in at least one place. Slugs are said to have caused damage elsewhere. From Wisbech the following report has been received :—

The favourable outlook for the gooseberry crop has not been realised, owing to frosts towards the end of the month, and great quantities of berries have fallen. Plums are setting well and there are signs of a good crop, while the strawberries seem everywhere to be full of promise. Apples have suffered severely from caterpillars of the "winter moth" and many trees have been stripped of their leaves, while the "apple sucker" is very busy at the bases of the tuusses of bloom. Large numbers of the winter moth caterpillars have descended to the gooseberry bushes and are now attacking the berries. The quantity of winter moth and apple sucker is all the more remarkable owing to the great increase of spraying this season, but none of the washes on the market seem to be of much effect against apple sucker owing to the difficulty of getting the spray fluid to touch the insect. In most cases, too, the spraying was not done sufficiently early and in many case, not thoroughly.

In the Holland Division of Lincolnshire the same remarks apply as to apple sucker and winter moth, and if crops are to be obtained, winter banding must become more general both here and in the Wisbech district. Gooseberries are cropping well and some growers have already begun to pick. There is a good show of blossom on the strawberries and a heavy crop should be the result.

From South-east Kent it is reported that the warm rains of the last ten days of May encouraged rapid growth, but the earlier sown crops have not picked up. There were exceptionally good prospects for all kinds of fruit. The frost in April did not harm the gooseberries (apricot the only blossom here destroyed). Good crops of gooseberries are being picked, good crops of cherries, pears, plums, red and black currants expected, strawberries are in full bloom, raspberries nearly full bloom. Good prospects of each of these crops. Some orchards badly attacked by caterpillars. Sheep and lambs thriving well generally. All farm crops generally looking exceedingly well. Mangolds, worst crop, have not come up well.

Germany.—The report issued by the German Statistical Bureau on the state of the crops in the middle of May, states that the weather in the latter half of April was unusually cold and wet, so that plants made little progress and spring planting was more or less delayed. At the beginning of May warmer weather with rain prevailed, which encouraged growth very much. The condition of the winter-sown crops was in general satisfactory, especially winter wheat and spelt, and early sown rye, but late sown rye has suffered from frost and the wet cold spring. The planting of the spring crops, including potatoes, has been delayed by the weather. The numerical condition of the different crops was as follows:—Winter wheat, 2·3; spring wheat, 2·6; winter spelt, 2·1; winter rye, 2·6; spring rye, 2·3; spring barley, 2·3; oats, 2·5; (1=very good, 2=good 3=medium (average), 4=small, 5=very small).

Hungary.—The report issued by the Hungarian Agriculture Department on the state of the crops in Hungary in the middle of May, states that favourable weather has been experienced since the beginning of the month. This has been everywhere beneficial, particularly where there had previously been sufficient rain. Winter wheat has much improved, but is still weak in many places. The condition of winter rye is regarded as medium. Winter barley is excellent in many districts, while the spring grain crops are generally satisfactory, except in Alföld and some districts on the right of the Danube where rain is wanted.

India.—The final official General Memorandum on the Indian wheat crop, of which a telegraphic summary is given in *Dornbusch* (27th May), gives the area for 1907-8 as 21,000,000 acres compared with 29,465,550 acres in 1906-7, and 25,357,000 acres the average of five years. The yield is estimated at 5,750,000 tons, against 8,471,000 tons in 1906-7, and 7,673,000 tons as the five year average.

United States.—The Bureau of Statistics of the Department of Agriculture reports that the area under winter wheat in cultivation on 1st May was about 29,751,000 acres, showing about 4·2 per cent. of 1,318,000 acres of the area sown to have been abandoned or given to other crops. The area is, however, 1,619,000 acres more than the area of winter wheat harvested last year. The average condition is given as 89·0, against 91·3 on 1st April, 1908, and 85·8 the mean of the averages of the past ten years. Of the total acreage of spring ploughing contemplated, 66·6 per cent. is reported as actually done on 1st May as compared with 71·5 on 1st May last year. Of spring planting 54·7 per cent. is reported as having been completed on 1st May, which compares with 47 per cent. last year. The average condition of winter wheat on 1st June was 86 as compared with 89 in May. Preliminary returns make the area of spring wheat sown 17,710,000 acres, or an increase of 3·7 per cent. compared with last year.

Russia.—The Board have received through the Foreign Office a report on the condition of the winter crops in South Russia at the beginning of the spring of 1908. It is stated that the autumn of 1907 was very dry; subsequently copious rain fell, followed by sudden severe cold so that the sowings of winter wheat were very late, and sometimes could not be made. Snow was very late and was not general. When snow fell the condition of the winter crops was unsatisfactory nearly everywhere in the black earth zone, but the condition did not grow worse as the winter passed. Warmer weather came early in March, followed by cold sharp winds. This cold was prejudicial to the winter crops, and also hindered spring sowings which should have been unusually heavy on account of the considerable areas where winter crops had failed or had not been sown. A later report taken from the *Industrial Gazette* (14th May) states that the amount of winter grain sown in the autumn of 1907 was nearly everywhere less than the average, and owing to injury in the spring, 20 to 25 per cent. had to be re-sown. The spring crops are more satisfactory and may compensate for a short winter crop.

Hops in Bohemia.—The Board have received through the Foreign Office a report from the British Consul at Prague stating that the hop plants in Bohemia have come through the winter well, in spite of the light covering of snow. At the beginning of May pruning was nearly finished. In the Saaz district the area under cultivation is undiminished; in the Annhaer district it has decreased by 6 to 8 per cent., and the Dauba district by 20 to 25 per cent. It is estimated that in the country as a whole, the cultivation of this crop will be reduced by $2\frac{1}{2}$ to 3 per cent. There are very few hops remaining from last year.

Hops on the Pacific Coast.—The British Consul at Portland, Oregon (Mr. James Laidlaw), in a despatch dated 8th May, received through the Foreign Office, states that according to the latest reports, many of the smaller hop growers have either ploughed up their yards or left them uncultivated, reducing the acreage in Oregon between 5,000 and 6,000 acres, and in Washington about 2,500 acres. This represents a reduction of about 22 per cent.

The Board of Agriculture and Fisheries have been furnished by the Board of Trade with the following report, based on about 212 returns from correspondents in Agricultural Labour in England during May.—

Agricultural employment was generally regular throughout May, except that day labourers in certain districts lost a little time in the early part of the month through rain. Hoeing and weeding, potato planting, preparing the land for root crops and sowing spring corn caused a fairly good demand for this class of labour, which was usually fully met. A scarcity of men for permanent situations was reported from several districts.

Northern Counties.—Correspondents in *Northumberland*, *Cumberland* and *Westmorland* report that employment was generally regular throughout May, and the demand for extra labour was fairly good. Employment for day labourers was slightly interrupted by wet weather in *Lancashire*. In *Yorkshire* also day labourers lost a little time on account of the wet weather; men of this class were in demand in certain districts for preparing the land for green crops, hoeing, &c. There was some scarcity of men for permanent situations in this county.

Midland Counties.—Rain caused a little loss of time to day labourers in *Cheshire*. In *Derbyshire* and *Nottinghamshire* employment was generally regular, and the supply of labour about equal to the demand. There was a fair demand for extra labour in *Leicestershire*, as farmwork was somewhat behindhand; men for permanent situations were reported as rather scarce. Day labourers in *Staffordshire* and *Shropshire* were in somewhat irregular employment at the beginning of the month on account of rain, but afterwards this class of labour was in fairly good demand for such work as hoeing corn, potato planting, preparing the land for root crops, and sheep shearing. There was generally a full demand for day labourers in *Worcestershire* and *Warwickshire*, with an adequate supply; men for permanent situations were rather scarce in the latter county. Wet weather caused some interruption to employment in *Northamptonshire* and *Oxfordshire*, where, when the weather permitted, hoeing, threshing, and other work generally provided sufficient employment for extra labour. A demand for shepherds, wagoners, and cowmen is reported from the Wellingborough Union (*Northamptonshire*). Employment was fairly regular in *Buckinghamshire*. Extra labour was in some demand for hoeing and threshing in *Hertfordshire*. In *Bedfordshire* wet weather caused day labourers to be in irregular employment during the early part of the month; the supply of this class of labour was generally balanced by the demand.

Eastern Counties.—Employment in *Huntingdonshire* and *Cambridgeshire* was hindered by rain to some extent. Outdoor work was somewhat in arrear at the commencement of May, but good progress was made towards the end of the month. The backward state of the crops occasioned a demand for extra labour in *Lincolnshire*, and several correspondents reported an insufficient supply. Wages at the May hirings generally remained unaltered. Some day labourers lost a few days through rain in *Norfolk* and *Suffolk*. The supply of, and demand for, labour were generally about equal, work being plentiful in hoeing, carting and spreading manure, and threshing. Employment in *Essex* was generally reported as regular.

Southern and South Western Counties.—The supply of extra labour in *Kent* was more than sufficient for the demand, and there was some irregularity of employment in consequence in certain districts. Hoeing and weeding, potato planting, &c., generally provided regular employment in *Surrey* and *Sussex*. Similar reports come from *Hampshire* and *Berkshire*. Some scarcity of men for permanent work was reported in certain unions. There was generally regularity of employment in *Wiltshire*, *Dorset* and *Somerset*, with the supply of labour about balanced by the demand. There was a good demand for labour in *Herefordshire*, but some day labourers were in irregular work at the beginning of the month through rain. Employment was fairly regular in *Gloucestershire*. Day labourers were in some demand for hoeing corn and roots, but the supply was in general quite sufficient. Employment was plentiful in *Devonshire* and *Cornwall* in hoeing, sowing mangels, and preparing land for other crops, but the supply of extra labour was usually equal to the demand.

Opening for Agricultural Appliances in the North of France.—H.M. Consul at Dunkirk (Hon. R. Walsh, M.V.O.), writing with reference to openings for British trade, observes that the north of France is very rich agriculturally; and that there appears to be an increasing

Miscellaneous Notes. tendency on the part of farmers to employ the most up-to-date mechanical appliances appropriate to their different needs. Ploughs, sowing machines, chaff cutters, pulping machines, separators, churns, &c., are to be found for sale in most of the market towns in that region, and British marks seem to be well in favour. From personal observation and enquiry, H.M. Consul is of opinion that dealers in these wares throughout the country districts prefer dealing directly rather than through travelling agents, as they have the feeling, which may be quite erroneous, that either directly or indirectly they themselves have to pay these agents, thus adding to the cost of the article. British sellers should, therefore, obtain satisfactory results from the generous circulation throughout the country towns of well-illustrated catalogues, in which prices and terms are clearly expressed. Such catalogues would naturally be more easily understood if issued in French, or if quotations, at all events, were given in both English and French currency. (*Board of Trade Journal*, 23rd April, 1908.)

The Zurich Seed-testing Station.—The number of samples of seed examined at this Station in 1906-7 was 9960, of which 2706 came from Swiss sources and 7241 from abroad (1291 from the United Kingdom). The number of foreign samples tested at this Station has considerably increased in recent years; in 1898-9 it was 4846, while in the five years 1902-1907 it was on the average 6748. There are now 168 foreign firms whose seeds are tested here.

Exportation of Butter from New Zealand.—It is provided in an Act (No. 37 of 1907) dated the 17th Nov. 1907, that any person who exports or attempts to export any butter from the Dominion of New Zealand, which contains more than 16 per cent. of water shall be liable to a fine not exceeding £50.

Importation of Fruit and Plants into New Zealand.—An Order in Council, dated 20th February, 1908, has been issued providing Regulations under "The Orchard and Garden Pests Act, 1903," in regard to the importation into New Zealand of fruit or plants.

The Order under notice revokes various Proclamations and Orders in Council prohibiting and regulating the importation of certain fruits and plants, and provides that such articles may be entered only at the following ports, viz., Auckland, Wellington, Christchurch, Dunedin and Bluff. It is provided, however, that direct consignments of fruit or plants for other ports may be examined at one of the above-mentioned ports, and a permit issued allowing the landing of the fruit or plants at the port of destination. The Regulations also provide for the forms of certificates which are to accompany the various kinds of fruit and plants, also for the fumigation or destruction of any fruit or plants affected with the diseases specified in the Schedules to the Order in Council. (*Board of Trade Journal*, 23rd April, 1908.)

Agriculture in Kurdistan, Asia Minor.—The Board have received through the Foreign Office a report by H.M. Vice-Consul at Diarbekir (Mr. W. B. Heard), on the agriculture of Central and Southern Kurdistan. The soil in this district is generally rich and productive, whilst the climate leaves little to be desired from the farmer's point of view. Little, however, is done to profit by these natural advantages. Agricultural methods are extremely primitive, and the soil does not yield anything like what it would if properly cultivated. Wheat, barley and millet are the most important crops. The ploughs are drawn and the corn is trodden out by oxen. Flails and threshing machines are unknown. Mr. Heard observes, however, that though utterly incapable of introducing any improvement into existing methods, on their own initiative, it is probable that the natives would not disdain the use of agricultural machinery and labour-saving appliances, when once they had been shown by practical demonstration the advantages to be derived from them.

Daily Forecasts of Weather during Harvest, 1908.—During the harvest season the Meteorological Office will, as before, supply forecasts of weather by telegraph to persons desirous of receiving them, upon payment of the cost of the telegrams. The forecast will contain twelve words, and the cost will be 6d., with $\frac{1}{2}$ d. for each word in the address.

Applications for the forecasts should be sent to the Director, Meteorological Office, 63, Victoria Street, London, S.W., with a cheque or postal order to cover the cost of the telegrams for the period, which should be not less than six consecutive days, during which the forecasts are to be sent.

The office is also prepared to send notification by telegram when the conditions appear favourable for a spell of settled fine weather. The notification will take the form of a forecast covering a period of not less than two days following date of issue. Those who wish this notification must deposit a fee of 2s. 6d., which includes cost of telegram.

Demand for Fertilizers and Machinery in Poland.—The Acting British Consul-General at Warsaw (Mr. E. B. St. Clair) reports that the total turnover of the Warsaw Agricultural Society (Towarzystwo Rolnicze Warszawskie, Z. Okolnik, Warsaw), in 1907 was 70,000/., while in 1906 it was only 44,000/.. Of this 70,000/., 18,000/ was spent in purchasing machines and implements, 26,000/ for manures and 11,100/ for seeds. The total turnover of all the agricultural societies in Poland amounts to about 300,000/ a year. The societies have lately ceased to import superphosphates and basic slag from Germany, ordering them instead from Belgium and the Netherlands. The amount of superphosphate required in Poland is 12,000 tons, and of basic slag about 28,000 tons. There may possibly be an opening here for British firms.

Owing to the high prices of grain, the farmers were well off in 1907, and a considerable amount of business was done in agricultural machinery. A larger number

than usual of portable engines and threshing machines were purchased at the end of the year, in order to get the grain ready for sale as early as possible, and to take advantage of the high prices. A number of cultivators and machines for dressing grain and chaff cutters were bought. The peasants also bought many chaff-cutters, small threshing machines, and ploughs. In many parts of Poland there was a demand for steam cooking apparatus to prepare potatoes as food for cattle. (*Board of Trade Journal*, 16th April, 1908.)

Consumption of Timber in the United States.—The United States Department of Agriculture have issued a circular (No. 129, Forest Service) dealing with the drain on the American forests. No very accurate statistics are available, but the information collected by the Census Bureau and the Forest Service goes to show that the annual consumption of wood in all forms in the United States in 1906 was at least 100 billion board feet, and possibly much more. The annual growth has been estimated at from 30 to 42 billion feet, but it is considered that taking into account all the drains upon the forests, the annual growth is not more than one-third of the annual consumption of wood. Assuming a forest area of 700 million acres, the State or National Forests represent 22 per cent. of the total, the remainder being on unreserved public lands or in private hands, and the writer of the circular (Mr. R. S. Kellogg) states that this area is amply sufficient, if rightly managed, to produce eventually enough timber to supply the needs of the United States.

Agricultural Machinery in Chile.—H.M. Consul-General at Valparaiso reports that in the farming districts of Chile the use of machinery is becoming very general. America supplies the greater part of what is known as agricultural machinery, the machines from that country being light, just strong enough to do the work, and very tastily finished. Where heavy, strong machines are required, as mowers, for instance, British goods are supplied, but ploughs, threshers, hay presses, reapers and binders are imported mainly from America. One reason for this is no doubt to be found in the fact of America having at her command fine supplies of wood for use in the construction of machinery in which this material enters largely.

H.M. Consul at Coquimbo reports that agriculture rivals the copper industry in importance in that district, and though the work is mainly carried on in primitive fashion, there is a steadily increasing tendency to adopt the machinery and labour-saving devices used in countries more advanced in matters of applied science. (*Board of Trade Journal*, 2nd April, 1908.)

Use of Animal Gall-stones in Japan.—H.M. Consul-General at Chicago (Mr. A. Finn) has forwarded a copy of an article from the "National Provisioner" respecting the export of gall-stones from the United States to Japan. Shipments of these stones, from beef-animals, have been made from a packing-house in Chicago to Japan, and the Japanese are said to be willing to pay prices ranging from 100 to 175 dollars per lb. The reason for this is not known, but it is thought that the stones are used in physiological chemistry or in the process of dyeing fine fabrics, such as silk. This latter opinion is supported by the fact that the gall of an animal contains a considerable amount of colouring matter. (*Board of Trade Journal*, 2nd April, 1908.)

Assistance to Small Holdings in Sweden.—According to the agricultural statistics of Sweden for 1904 there are 350,851 farm holdings in that country, 314,151 of which are under 50 acres. The preponderance of small holdings has led the Government in recent years to take some steps for the encouragement and assistance of the peasant farmer, the first of which dates from the year 1901, when a grant of £1400 was allotted for distribution by the agricultural societies in premiums for small farms and in instruction for small holders. This grant has since been increased, and amounted in 1907 to £5,600; in addition about one-half as much is contributed by the Societies out of their own funds. In 1904 a sum of £560,000 was set aside for the purpose of State loans to enable labourers to acquire holdings or cottages, and in 1906 a fund of £17,000 was created for the promotion of cultivation in the Northern Provinces.

Of these measures, that of giving premiums as an inducement to good farming is of interest. The method adopted is to allot a certain district to each Agricultural Society, and three persons are then appointed by the Society as Judges, who personally inspect each of the holdings which is entered for competition. A limit is placed on the size of the holding, varying in different districts from 15 to 30 acres as a maximum and 2½ to 5 acres as a minimum. The premiums may be either money prizes or small advances. The prizes vary in value from about 28s. to 112s., and may be given more than once in respect of the same holding. The advances are granted for the carrying out of small improvements approved by the Judges, and in some cases when the work has been satisfactorily executed, repayment is not required. Diplomas are also given to those who have obtained the first prize.

In 1905 the number of competing holdings was 1,137, representing in all about 15,000 acres, of which 768 received prizes and 227 small advances. (*Mitt. Deut. Land. Gesell.*, No. 32, 1907.)

Causes of Death of Chickens raised in Incubators.—An investigation has recently been carried out at the Connecticut Storrs Experimental Station (*U.S. Farmers' Bulletin*, No. 309) into the causes leading to the death of chickens raised in incubators. Several lots of chickens were given different kinds of food, and it was found that the mortality was high when a certain mixture was used. Careful examination showed that this food contained a somewhat large proportion of musty grain. The young chicks ate all the grains indiscriminately, and their lack of ability to detect wholesome from unwholesome foods was further tested by giving them such substances as sawdust, coarse salt, and granulated sugar. These materials were eaten as readily as the grains with which they were mixed. Indeed, the salt and sugar were always selected first, apparently owing to their bright appearance; but as a rule the chicks did not appear to relish them.

When older chicks hatched by hens, and also those taken from the incubators and given to the hens, were offered these same mixtures, it was exceptional to find a chick that took over a grain or two of salt, sugar or sawdust. When musty food was given to the older incubator chicks it was noticed that those eight or nine days old showed considerable discrimination in selecting the grain, while still older chicks refused even larger proportions of the musty grains. It seems probable therefore that a proportion of the losses of incubated chickens may at times be due to the use of musty food.

Subsidies for Cold Storage Warehouses in Canada.—The policy of giving financial assistance towards the erection of public cold storage warehouses in Canada was adopted by the passing of an Act in 1907, "to encourage the establishment of cold storage warehouses for the preservation of perishable food products." The Act provides that a subsidy not exceeding 30 per cent. of the amount expended in the construction and equipment of such warehouses, payable one-half on completion and the remainder in instalments during the four following years, provided the warehouse is maintained and worked to the satisfaction of the Minister of Agriculture. A copy of the Act and Regulations is given in the Report of the Dairy and Cold Storage Commissioner for 1907.

Heating of Hay-ricks.—M. Miche in the *Revue Scientifique* (25th January, 1908) suggests that the heating of hay-ricks is due to bacteria, and shows as the result of experiment that sterilised hay never becomes heated, but if it is sprinkled with water in which ordinary hay has been steeped a rise in temperature is immediately produced. Heating up to about 122° F. is said to be chiefly due to *Bacillus coli* and *Oidium lactis*, and above that temperature *Bacillus calfactor* is the principal agent, and has its maximum vitality at about 150° F. One curious fact is that the hay in the interior of an over-heated rick is completely sterile, the micro-organisms being apparently finally destroyed under the continued influence of a high temperature. (*Rev. Gén. Agronomique*, January, 1908.)

Consumption of Wheat in the United States.—The *United States Crop Reporter* (March, 1908), published an estimate of the average annual consumption of wheat

for food in the United States in the six years, 1901-7, which indicates a consumption of between 5'41 and 5'55 bushels, or about 5½ bushels per head.

Agricultural Machinery in Roumania.—The British Vice-Consul at Galatz reports that the use of agricultural machinery is steadily extending, and the importation of such articles is increasing at Galatz. American manufacturers are putting a large number of machines, especially reapers, on the market. (*Board of Trade Journal*, 30th April, 1908.)

Agricultural Machinery in Spain.—H.M. Consul at Cadiz (Mr. A. L. Keyser) reports that the progress in Spain of modern methods in agriculture during the last ten years has been marked, more especially in the neighbourhood of large towns such as Seville, where stocks of machinery are kept and can thus be brought to the notice of small farmers.

Though the "trade" is well aware of the opening presented in matters agricultural in Spain, they are met by the difficulty that there are comparatively few people who farm on a large scale and are able to afford the outlay necessary to stock a farm with modern appliances. The cost of a threshing set, for instance, is £700 to £800. As few farmers can meet such an expense, the majority adhere to the system which has, from time immemorial, sufficed. It has also to be remembered that the bad condition of the roads, and in many districts their total absence, is a serious obstacle to the introduction of agricultural machinery. (*Board of Trade Journal*, 7th May, 1908.)

OFFICIAL CIRCULARS AND NOTICES.

The Board have issued the following circular, dated 16th May, 1908, to Local Authorities in Great Britain under the Diseases of Animals Acts:—

**Circular as to
Glanders or Farcy.**

SIR,

I am directed by the Board of Agriculture and Fisheries to advert to their circular letter (A¹⁵⁰ C) of the 26th August, 1907, forwarding to you a copy of the Glanders or Farcy Order of 1907, which came into operation on the 1st of January, 1908, and I am to say that the Board are anxious to obtain information as to the action taken in each case of Glanders, with a view to enable them to ascertain the general effect of the Order as well as to compare the procedure adopted and the measures taken by Local Authorities for its enforcement.

It would be of value to the Board in this connection if, in respect of each outbreak of Glanders in the district of your Local Authority, a statement could be furnished giving particulars as to the number of clinical cases, the number of horses tested, the number of definite reactors to the first and second tests, the number of horses slaughtered or which have died, and also a description of the lesions found. It would be convenient if this information could be furnished on a form similar to that printed overleaf.*

The Board would be obliged if your Local Authority would arrange to supply them with this information as regards each outbreak that has occurred in their district since the commencement of the current year, and also as regards future outbreaks. The statement should be furnished on a separate form for each outbreak as soon as all the tests have been completed and the results are known, or in prolonged cases within a month of the first notification of the disease.

I am, &c.,

T. H. ELLIOTT,

Secretary.

* Not printed.

The Board have addressed the following circular, dated 16th May, 1908, to County Councils and the Councils of Boroughs and Urban Districts in England and Wales :—

Compulsory Hiring and Purchase of Land for

Small Holdings.

SIR,

I am directed by the Board of Agriculture and Fisheries to enclose herewith, for the information of your Council, two copies of Regulations which have been prepared by the Board dealing with the Compulsory Hiring and the Compulsory Purchase of land for small holdings and allotments under the provisions of the Small Holdings and Allotments Act, 1907.

The Regulations have been placed on sale, and further copies can be obtained, price 1*d.* each, from Messrs. Wyman and Sons, Limited, Fetter Lane, London, E.C.

I am to add that, as your Council are probably now engaged in making inquiries with a view to the acquisition of suitable land to meet the demand for small holdings or allotments, the Board are of opinion that special attention might be given to the glebe lands attached to benefices. The Board think that in the great majority of cases the clergy will be very willing to let or sell their glebe to the Local Authorities who are responsible for the provision of small holdings and allotments, and it should be possible to obtain a considerable quantity of land in this manner without any unreasonable disturbance of existing tenants. It is often the case that the glebe of a parish is let to one of the local farmers, who holds other land as well, and the Board think that arrangements might be made with them to surrender the glebe for the purpose of satisfying the needs of those applicants in the parish who are unwilling to move.

I am to add that a return of glebe lands in England and Wales was issued to an order of the House of Commons in 1887, showing the parishes in which glebe lands are situated, with their acreage and gross estimated rental. The particulars given in the return have been somewhat modified by subsequent purchases and sales, but the Board think that it would afford your Council useful information as to the extent and situation of the glebe lands in their area, and that it might be worth while to communicate with the beneficed clergy with a view of ascertaining whether they would be willing to entertain an offer to let or sell the whole or part of their glebe, and, if so, at what date they could arrange to give possession of the land. Copies of the return (No. 307 of 1887) can be obtained from Messrs. Wyman and Sons, Limited, Fetter Lane, London, E.C., price 2*s.* 1*½d.* each.

I am, &c.,

T. H. ELLIOTT,

Secretary.

An Order, dated 20th May, 1908, has been made by the Board of Agriculture and Fisheries, the effect of which is to add the Administrative County of Hereford

and certain parts of Gloucestershire to the area in South Wales, &c., already scheduled for the purposes of the Swine Fever (Regulation of Movement) Order of 1903, which Order is superseded, as from the 1st June, 1908, by the Swine Fever (Regulation of Movement) Order of 1908.

Any existing Regulations of Local Authorities within the scheduled area, as to the movement of swine into or within their districts, are revoked as from the date mentioned.

The Board have issued the following Circular dated 26th May, 1908, to County Councils and Councils of County Boroughs in England and Wales :—

Circular as to Small Holdings Act.

SIR,

I am directed by the Board of Agriculture and Fisheries to say that they are constantly receiving inquiries as to the correct interpretation of the words "will themselves cultivate the holdings" which occur

in section 1 of the Small Holdings Act, 1892, and in section 6 of the Small Holdings and Allotments Act, 1907, and the Board think it desirable therefore that they should state for the information of your Council what in their opinion is the practical effect of the words quoted. The question is one of considerable importance in view of the fact that if the words are construed in too narrow a spirit the effect might be to exclude from the benefits of the Acts a considerable number of applicants who desire to obtain land to be used as an adjunct to their present employment, and to limit the operation of the Acts to the provision of self-supporting small holdings the cultivation of which would occupy the whole time and attention of the holder.

Sections 1 and 9 (1) (c) of the Act of 1892, and section 6 (1) of the Act of 1907, which limit the sale or letting of small holdings to persons who will themselves cultivate the holdings and require that the holding shall be cultivated by the owner or occupier, should be read with section 7 of the Act of 1892 which requires the Council to make rules for guarding against any small holding being let or sold to a person who is unable to cultivate it properly, and the object of these provisions taken together appears to be to secure that the small holder shall not only possess the skill and ability necessary to cultivate the particular holding, but shall also personally apply such skill and ability to the cultivation of the holding. This interpretation would not exclude the use of hired labour to assist in the cultivation of the holding or the employment by the small holder of the members of his own family. It also permits of a different standard of skill and ability being adopted in accordance with the nature of the cultivation that is required for the particular holding or kind of holding applied for, which may vary between an arable farm of 50 acres under special cultivation and a meadow of little more than an acre. In this connection I am to point out that section 20 of the Act of 1892 defines the words "agriculture" and "cultivation" to include horticulture and the use of land for any purposes of husbandry, inclusive of the keeping or breeding of live stock, poultry, or bees, and the growth of fruit, vegetables and the like.

The Board are of opinion, therefore, that there is nothing in the Acts which would prevent a Council from providing holdings for those applicants who, while already engaged in some occupation, have sufficient spare time to be able to cultivate successfully a small holding. The experience of the past in many parts of the country shows that such men often succeed well as small holders, and the acquisition by them of small quantities of land as an adjunct to their present occupation frequently makes just the difference between bare subsistence and comparative prosperity. It is for this reason that many of the most successful small holdings in the country are to be found in districts where the surrounding agricultural conditions afford piece work of various kinds, or where there are in the neighbourhood mines or other industries which do not occupy the whole time of the workers.

The Board think, therefore, that as a general rule a Council would not be justified in declining to accept applications from men who desire to obtain small holdings as an adjunct to their present occupation or in giving such applications a secondary place in their consideration as compared with those of men who propose to make their whole living off their holdings.

I am, &c.,

T. H. ELLIOTT, *Secretary.*

REVIEW OF MARKET PRICES IN MAY.

A. T. MATTHEWS.

The weather of the first two days was remarkably warm and close, causing some trouble in the dead-meat market, salesmen being unprepared for the sudden change of temperature. This had a rather bad effect on the trade for live cattle, particularly at markets held on 4th and 5th May. London declined $\frac{1}{2}d.$ per lb., following a bad trade and lower prices at Norwich on the Saturday. Taking the average of the selected markets, during the first week beef hardly maintained its price, but in a few places there was a slight improvement. Fat sheep, now mostly clipped, were rather too heavily supplied at some markets, but the majority were firm and unchanged. The larger numbers were doubtless owing to the end of the root crop being nearly reached. The first May market at Islington was a little better for clipped sheep, but those in wool were neglected. Lambs were over supplied, and, many being too forward and heavy for the trade, business with them was sluggish, and a considerable number were not sold, 7s. per 8 lb. being the top price.

The dead-meat trade was dull, many carcases being affected by the weather ; prices were normal, but beef was a little lower than the previous week. Mutton also sold slowly ; English tegs fetching $7\frac{1}{2}d.$, showing a decline of $\frac{1}{2}d.$ per lb. Veal was exceptionally difficult of sale, even at a heavy reduction. Good English was selling at 4s. and prime Dutch at 4s. 4d. per 8 lb. As frequently happens, prices for veal were much lower in London than in many of the country markets, Smithfield being so easily reached from Holland. Notwithstanding the weather there was a full supply of porkers, but this article is out of season, and sellers found the greatest difficulty in moving it at 5d. per lb. Small West Country lambs were in demand at $11\frac{1}{2}d.$ per lb. and second quality at $10\frac{1}{2}d.$.

Second Week.—The cattle markets fully recovered from the brief depression of the previous week, and, with a few exceptions, such as Ipswich, Leicester, Aberdeen, Dundee and Glasgow, there was a much reduced supply. Prices

advanced $\frac{1}{4}d.$ per lb. at many markets, especially for first quality.

Sheep were much more saleable, the following markets being very firm or dearer :—Carlisle, Darlington, Dorchester, Hull, Leeds, Leicester, London, Newcastle, Salford, Shrewsbury, Wakefield, Wolverhampton, York, Ayr, Dundee, Glasgow and Inverness. Against these only the following were slow or lower :—Hereford, Ipswich and Liverpool. At some few markets clipped sheep made fully as much as those in the wool, while at Hull the curious feature was observed that half-fed sheep sold better relatively than those well finished, the former being in good demand for grazing. Pigs of all classes were dull and prices low.

Following the live-stock markets and with lighter supplies from America, the dead-meat market was decidedly better for beef. Scotch short sides advanced to $6\frac{3}{4}d.$, long sides firm at $6\frac{1}{2}d.$, and English realised $5\frac{3}{4}d.$ to $5\frac{1}{2}d.$ per lb. Chilled American hind quarters advanced $\frac{1}{2}d.$ per lb. and fore quarters $\frac{1}{2}d.$, the whole sides averaging $5\frac{1}{2}d.$ to $5d.$ per lb. Deptford killed sold with readiness at $6\frac{1}{2}d.$ per lb. at London, which exceeded the price of English by $3d.$ per 8 lb. Argentine chilled beef, however, showed no advance, and frozen was the turn cheaper. Mutton was firm, small Scotch tegs occasionally making $9d.$ per lb., and English of moderate weight as much as $8d.$ Lamb was a quiet trade, small carcases fetching up to $11\frac{1}{4}d.$ per lb. Veal was in much smaller supply, and improved to the extent of $1d.$ per lb.; and pork $\frac{1}{2}d.$, at any rate in the Central Market.

Third Week.—Islington market on Monday, 18th May, was better supplied with fat cattle, there being 1,090 on offer, but the extra 300 did not keep pace with the demand. Such an increase means little in London when the great wholesale buyers are competing, as was the case on that day. The market may be described as excited, and one dealer alone had disposed of 130 fine cattle by 7 A.M. The market was nearly clear by 11 A.M., and many more might have been sold. It was, undoubtedly, the best market for beef that has been held at Islington during the past four years. Prices were occasionally much higher a quarter of a century ago, but it is long since we have seen ordinary Shorthorns fetching 5s. per 8-lb. stone, and this was reached in many instances for Irish-bred cattle, whose

excellence lay chiefly in the fine finish given them in the Norfolk yards. Even second quality animals were freely taken at 4s. 8d. per 8-lb. stone, and some choice lots were proved by the weighbridge to have realised 5s. 4d. per stone.

A word about the weighbridge might be permitted here. It is well known that it has become very popular in the North, but its use in London has hitherto been restricted. I can, however, see a steady and constant growth in the estimation in which it is held at Islington, and have little doubt that its use in the future will largely increase. It has often struck the writer how easily the farmers might avail themselves of this means of knowing the actual weight of their animals and the price per stone realised. They would only have to instruct the salesmen to weigh every animal either before or after sale, and enclose the weighbridge ticket with the cheque.

London was the only one of the selected markets which in the third week of May was quoted as high as 5s. per 8-lb. stone for Shorthorns, and but for the weighbridge there would have been no means of proving the quotation correct; but, as stated above, several animals were shown by its use to have been actually sold at 5s. 4d. per 8-lb. stone, which is fully equal to 7½d. for the dressed carcase. This price is the equivalent of 8s. 9d. per stone of 14 lbs. The trade for fat sheep was better at many country markets than in London, where prices were firm, but no higher, whereas there was a distinct advance at Chichester, Darlington, Derby, Hereford, Hull, Leeds, Newcastle and Norwich. At the London Central Market short sides of Scotch beef made up to 6s. 4d. per cwt., i.e., 7d. per lb.; long sides, 6s. 8d.; English, 5s. 4d.; and American port killed, 5s. 4d.; all showing a decided advance. Mutton was, on the contrary, rather weaker, a notable feature being that English was quoted 1d. per lb. higher in Manchester than in London. At the former market English mutton was quoted at 8½d. and Scotch 9½d. per lb. London was very low for veal compared with country markets, the top price being 6s. 4d. per cwt. against 6s. 8d. at Birmingham, 7s. 4d. at Leeds, 7s. at Manchester, and 7s. at Liverpool.

Fourth week.—The advance in beef showed no sign of giving way at the close of the month, although buyers were more cautious. Islington on the 25th was well supplied with 1,140

fat cattle, the quality of which was still well maintained. The market was written down $\frac{1}{2}d.$ per lb., the top quotation being $7\frac{1}{2}d.$ for Norfolks, but there were certainly a few prime steers which made $7\frac{1}{2}d.$, although not so many as on the 18th, and the weighbridge again recorded 42s. 8d. per cwt. for at least one lot. Sheep mustered 7,100, and met a dull trade at $\frac{1}{2}d.$ per lb. decline all round. Lambs were far too numerous for the demand, and prices fell $1\frac{1}{2}d.$ per lb.

In the Central Market beef values were well maintained, except that at the end of the week American chilled lost a little further ground. At first sight this fact appears surprising, as the present high rates are supposed to be due to the short supply of this article, but the reason undoubtedly was the greater effect of the warm weather on the refrigerated beef. At the first advance in our markets Denmark, as usual, immediately sent forward a few hundred sides of beef, but the movement was not followed up on account of the higher temperature. Carcase mutton met a slow demand, and English wethers of good quality sold at 7d. per lb., but small Scotch tegs were very scarce and fetched fancy prices. Taking the country markets as a whole they were decidedly better for beef on the week. The keynote of nearly all of them was the excellent quality of the cattle on offer. At Hereford and Leicester $7\frac{1}{2}d.$ per lb. was freely quoted. Fat sheep were more irregular, but the tendency generally was firm for good quality. The trade for fat lambs was slow almost everywhere, and many complaints were made of want of condition. This might have been expected after the unpropitious weather for fattening lambs which prevailed till quite recently. The price of mutton at many of the principal markets was much the same as in London, viz.:— $7\frac{1}{2}d.$ to 8d. per lb. for shorn sheep of 72 to 80 lb. The $8\frac{1}{2}d.$ quoted in London being for exceptionally small tegs of about 64 lb.

Store Stock.—The rapid progress of vegetation during the month, together with the good trade for beef and mutton, rendered a sharp demand for store stock inevitable. There is a decided scarcity of forward cattle suitable for immediate preparation for the butcher, but all classes and ages are in good demand at very full prices. At Norwich some Marsh cattle of excellent quality reached £22 10s. each, while prices per cwt. are frequently as high for store cattle as those for

finished beef. This ought not to be the case if a fair profit for grazing is to be realised. The sudden flushing of the milk yield consequent on the cows going to the luxuriant herbage of the pastures has had a quieting effect on the demand for newly calved or down-calving cows, especially in London, where the best cows on offer are only making £22 without the calf. This, however, is an annual occurrence, and the check is probably only temporary. In many parts of England weaning calves are very dear, so many of the best having been sold for veal. This, in the writer's opinion, is a short-sighted policy.

The Wool Sales.—The May series of sales of Colonial wool were looked forward to with gloomy anticipations of a very bad trade. They opened indeed with a decline, and a good deal more wool than usual was left unsold, much of which was withdrawn without being offered. As the sales progressed, however, a marked improvement in the bidding set in and there was very good competition, especially for cross-breds. The lost ground was recovered and the sales closed at an actual advance, in some cases of 5 to 10 per cent. on the closing rates of the last sales.

REVIEW OF THE PROVISION TRADE IN MAY.

HEDLEY STEVENS.

Cheese experienced a poor demand throughout the month. Continued large arrivals of New Zealand cheese prevented an expected advance in prices for Canadian, and in consequence the stocks on hand mostly showed losses to owners. To force the sale of New Zealand cheese, proportionately lower prices had to be accepted (especially as the quality of some was not altogether satisfactory) and in comparison with May of last year a reduction of from 6s. to 7s. per cwt. took place whilst Canadian averaged about 3s. to 5s. below prices current at same period. New season's fodder-made Canadian commenced to arrive in the second week of May, and showed plenty of quality, but was slow of sale, as the price then asked was within 2s. to 5s. of finest old makes, the latter being considerably better value at the difference.

The Canadian season opened about two to three weeks later

than usual on account of the cold backward spring, and in consequence fodder makes were much below the average quantity. Canadian advices report a poor condition of cattle, brought about by the severe winter, and fewer milking cows in the country, high price of feed having caused a large number to be slaughtered.

Stocks of last season's English cheese are generally reported to be about the same as last year, with prices 8s. to 10s. lower for Cheddar. There was a larger quantity made, but the increased supply has been consumed.

Bacon.—The month's trading has been very unsatisfactory. This has been chiefly caused by the increasing arrivals of Danish bacon, which is having a very important influence on the English and Irish bacon trade, as well as on the Canadian. The prices in the West of England during last month for pigs have averaged about 1s. per score less than during May of last year, say, equivalent to 7s. to 8s. per cwt. for prepared bacon. Breeders say that it does not pay them to breed and fatten at these prices, and judging by the immature pigs that are now being delivered to the curers, they are getting rid of their stocks.

During May the arrivals of Danish bacon into London alone exceeded the quantity in the same period last year by about 17,000 bales, a few of which would contain six sides and the remainder four sides each. This increase forced the London distributors to find fresh outlets for Danish bacon, and prices ranged from 9s. to 16s. below those current at the same time last year.

Pigs are still very dear in Canada, and on account of the unprofitable prices realized in England for bacon, the Canadian curers are killing only sufficient to keep their packing houses open. Arrivals of American bacon have been moderate, but importers are losing heavily on contracts made at the end of last year for regular future monthly shipments. I know of cases where merchants have had to accept prices for American singed sides, showing them a loss of 12s. to 13s. per cwt. (say 1½d. per lb.) to effect sales. Hams have also been a very dragging trade, influenced greatly by the cold weather.

The stocks of American bacon in English cold stores are considerably above the average for the time of year, and until

these are reduced we cannot expect much improvement in prices.

Butter.—Prices have been much above the average for the time of year, caused chiefly by the smaller arrivals of Colonial and Siberian, and the small stocks in cold stores in England. The cold backward season has seriously affected the April and May makes of butter in Ireland, owing to the flow of milk being exceptionally small. The demand has been only moderate for the entire month, buyers adopting a hand-to-mouth policy, fearing a slump in prices, which ranged from 7s. to 14s. higher than for the corresponding time last year.

Canada, from whence we used to receive large supplies, finds her home trade taking all the butter she has manufactured since the opening of the new season, at prices which put her out of the English market; and butter shippers report that they do not think they will have much for export again this year, their largely increased population in the West taking the supply from Ontario and Quebec, which a few years back was exported to England.

Eggs.—The cold weather greatly affected the supply of English and Irish eggs. Ireland was considerably behind in her supplies during the first half of May. During the latter half of the month supplies have been freer all round, with prices easier, and the Irish merchants have been busy pickling for their winter trade, which has prevented any undue pressure to sell for immediate consumption.

Shippers of Canadian eggs report that their trade with England this season is again likely to be small on account of the increased home demand.

PRICES OF AGRICULTURAL PRODUCE.

**AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND
in the Month of May, 1908.**

(Compiled from Reports received from the Board's Market Reporters.)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—				
Cattle :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Polled Scots ...	8 3	7 9	38 8	35 7
Herefords ...	8 2	7 6	—	—
Shorthorns ...	8 1	7 5	37 8	34 11
Devons ...	8 4	7 5	—	—
Veal Calves ...	per lb.* 8½	per lb.* 7½	per lb.* 8½	per lb.* 6½
Sheep :—				
Downs ...	8½	7½	—	—
Longwools ...	7½	7	—	—
Cheviots ...	9	8½	9	8
Black-faced ...	9	8	8½	7½
Cross-breds ...	8½	7½	9	8
Pigs :—	per stone.*	per stone.*	per stone.*	per stone.*
Bacon Pigs ...	s. d. 5 11	s. d. 5 6	s. d. 6 1	s. d. 5 5
Porkers ...	6 4	5 11	6 4	5 9
LEAN STOCK :—				
Milking Cows :—	per head.	per head.	per head.	per head.
Shorthorns—In Milk ...	£ s. 20 15	£ s. 17 19	£ s. 22 1	£ s. 17 17
“ —Calvers ...	21 16	18 5	20 8	17 2
Other Breeds—In Milk ...	17 10	14 7	18 3	15 1
“ —Calvers ...	15 0	12 10	19 0	15 19
Calves for Rearing ...	2 6	1 16	2 15	1 15
Store Cattle :—				
Shorthorns—Yearlings ...	10 18	9 5	10 5	8 9
“ —Two-year-olds ...	15 2	13 9	15 10	13 2
“ —Three-year-olds ...	17 18	15 15	16 12	14 7
Polled Scots—Two-year-olds	—	—	16 4	13 12
Herefords— “	15 13	14 8	—	—
Devons— “	14 18	13 1	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs, and Lambs—				
Downs or Longwools ...	48 2	43 8	—	—
Scotch Cross-breds ...	—	—	38 5	33 2
Store Pigs :—				
Under 4 months ...	22 10	16 10	20 0	17 1

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of May, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birming-ham.	Man-chester.	Liver-pool.	Glas-gow.	Edin-burgh.
BEEF :—		per cwt. s. d.					
English	1st	55 6	57 0	57 6	—	57 0*	56 6*
	2nd	53 6	53 0	54 0	—	53 6*	51 6*
Cow and Bull ...	1st	41 6	50 6	49 0	46 6	48 6	45 0
	2nd	36 6	45 6	43 6	42 0	40 6	38 0
U.S.A. and Cana-dian :—							
Port Killed ...	1st	57 0	55 6	56 6	56 6	53 6	—
	2nd	54 0	50 6	53 0	52 0	51 6	—
Argentine Frozen—							
Hind Quarters ...	1st	35 0	36 0	35 0	33 0	35 0	37 0
Fore ,," ,,"	1st	29 6	30 6	29 6	28 6	30 6	29 6
Argentine Chilled—							
Hind Quarters ...	1st	50 6	50 0	49 0	48 0	50 0	51 6
Fore ,," ,,"	1st	32 6	33 6	32 6	32 6	35 0	34 0
American Chilled—							
Hind Quarters ...	1st	62 0	62 0	61 0	61 0	63 6	63 6
Fore ,," ,,"	1st	39 0	41 0	41 0	41 0	39 6	42 6
VEAL :—							
British	1st	64 0	67 0	71 0	76 6	—	—
	2nd	58 6	54 6	64 0	69 0	—	—
Foreign	1st	66 0	—	58 6	62 0	—	53 0
MUTTON :—							
Scotch	1st	81 0	—	85 0	84 0	76 0	72 6
	2nd	71 0	—	79 6	78 6	70 6	60 6
English	1st	69 6	69 6	79 6	75 0	—	—
	2nd	62 0	60 0	70 0	70 0	—	—
U.S.A. and Cana-dian :—							
Port killed ...	1st	—	—	—	74 6	—	—
Argentine Frozen ...	1st	33 0	35 6	35 0	35 0	36 0	36 0
Australian ,," ,,"	1st	33 0	34 6	32 6	32 6	35 0	—
New Zealand ,," ,,"	1st	42 6	—	—	—	—	—
LAMB :—							
British	1st	104 6	97 0	99 0	99 0	112 0	—
	2nd	95 6	87 6	92 0	90 0	101 6	—
New Zealand ...	1st	53 6	54 0	52 0	52 0	56 0	58 6
Australian ...	1st	46 6	48 0	44 6	43 6	46 6	46 6
Argentine ...	1st	43 0	47 0	46 0	45 0	46 6	47 0
PORK :—							
British	1st	49 6	58 6	56 0	56 0	52 0	50 0
	2nd	44 6	52 6	49 6	50 0	—	42 6
Foreign	1st	48 6	55 6	55 0	55 0	—	—

* Scotch.

AVERAGE PRICES of British Corn per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act 1882, in each Week in 1906, 1907 and 1908.

Weeks ended (in 1908).	Wheat.			Barley.			Oats.		
	1906.	1907.	1908.	1906.	1907.	1908.	1906.	1907.	1908.
Jan. 4	28 4	26 0	35 1	24 6	23 11	26 9	18 2	17 3	18 4
" 11	28 6	26 1	35 2	24 8	24 2	26 9	18 4	17 4	18 3
" 18	28 5	26 1	35 5	24 11	24 1	27 1	18 4	17 5	18 5
" 25	28 7	26 2	35 6	25 1	24 5	26 11	18 7	17 5	18 5
Feb. 1	28 10	26 3	35 0	25 1	24 4	26 11	18 10	17 5	18 4
" 8	28 10	26 6	34 3	25 3	24 5	26 9	18 10	17 7	18 3
" 15	28 11	26 7	33 1	25 6	24 1	26 9	19 0	17 7	18 0
" 22	28 10	26 10	32 6	25 4	24 2	26 5	19 0	17 9	17 11
" 29	28 8	26 9	30 11	25 0	24 2	26 3	19 0	17 9	17 8
Mar. 7	28 5	26 8	30 5	25 1	23 11	26 1	18 8	17 11	17 8
" 14	28 5	26 10	31 3	24 8	24 2	26 0	18 10	0 17	17 10
" 21	28 4	26 10	31 7	24 4	24 0	26 2	18 8	18 1	17 11
" 28	28 3	26 8	31 4	24 5	23 9	25 10	18 11	18 2	17 10
Apl. 4	28 7	26 9	31 3	24 2	24 3	25 5	18 11	18 3	17 9
" 11	28 11	26 8	31 2	24 4	23 9	25 10	19 4	18 6	17 7
" 18	29 4	26 8	30 11	24 0	23 3	26 1	19 1	18 7	17 7
" 25	29 6	26 10	30 10	24 0	23 3	25 5	19 6	18 9	17 9
May 2	29 10	27 0	31 6	23 10	23 6	25 8	19 9	19 3	18 0
" 9	30 1	27 6	32 4	24 1	24 0	25 5	20 0	19 7	18 4
" 16	30 3	28 4	33 1	23 10	24 9	9	20 1	20 1	18 7
" 23	30 4	29 7	33 8	24 2	24 3	25 9	20 2	20 5	18 10
" 30	30 4	31 4	33 5	22 10	24 0	24 6	20 5	20 8	18 8
June 6	30 3	32 0	33 1	23 4	24 7	25 10	19 11	20 7	18 4
" 13	30 4	31 10		23 6	24 7		20 2	20 11	
" 20	30 5	31 4		22 10	24 11		20 2	20 9	
" 27	30 3	31 2		24 3	24 6		20 1	20 8	
July 4	30 2	31 3		23 0	24 8		20 2	20 11	
" 11	30 5	32 0		23 8	24 10		20 4	20 11	
" 18	30 3	32 6		23 2	24 6		20 5	21 1	
" 25	30 5	32 11		22 4	27 3		20 2	20 8	
Aug. 1	30 9	33 2		22 1	26 4		19 3	21 2	
" 8	30 5	33 5		23 0	26 6		17 11	21 3	
" 15	29 0	33 6		24 2	25 9		17 0	20 4	
" 22	27 9	33 7		25 0	25 0		16 10	19 8	
" 29	26 9	33 10		24 3	24 6		16 6	18 11	
Sept. 5	26 4	31 11		24 9	24 2		16 3	17 7	
" 12	25 11	31 4		24 3	24 4		16 1	17 6	
" 19	25 9	31 5		24 3	25 0		16 0	17 6	
" 26	25 9	31 8		24 8	25 3		16 2	17 8	
Oct. 3	26 1	32 6		25 0	25 5		16 3	17 9	
" 10	26 3	33 3		25 3	25 9		16 7	17 11	
" 17	26 6	34 4		24 10	26 3		16 8	18 0	
" 24	26 7	35 9		24 10	27 2		16 10	18 7	
" 31	26 7	36 3		24 8	27 7		16 11	18 10	
Nov. 7	26 6	35 10		24 8	27 8		17 1	18 10	
" 14	26 4	35 1		24 4	27 8		17 2	18 8	
" 21	26 3	34 7		24 1	27 5		17 3	18 9	
" 28	26 1	34 7		24 1	27 5		17 2	18 7	
Dec. 5	26 1	34 7		24 1	27 1		17 4	18 6	
" 12	26 1	34 8		23 11	27 0		17 3	18 5	
" 19	26 3	34 9		24 3	27 1		17 3	18 3	
" 26	26 0	34 6		24 1	26 10		17 3	18 0	

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates: Wheat, 60 lbs.; Barley, 50 lbs.; Oats, 39 lbs. per Imperial Bushel.

AVERAGE PRICES of Wheat, Barley, and Oats per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

	WHEAT.		BARLEY.		OATS.	
	1907.	1908.	1907.	1908.	1907.	1908.
France :		s. d.	s. d.	s. d.	s. d.	s. d.
April	...	38 9	—	26 2	—	22 10
May	...	40 3	38 8	26 6	25 11	22 9 19 9
Paris :		s. d.	s. d.	s. d.	s. d.	s. d.
April	...	39 10	38 5	26 7	26 2	25 6 19 3
May	...	41 9	38 5	26 2	26 2	22 11 19 3
Belgium :		s. d.	s. d.	s. d.	s. d.	s. d.
March	...	28 10	—	25 7	—	20 6 —
April	...	29 4	—	25 6	—	21 7 —
Germany :		s. d.	s. d.	s. d.	s. d.	s. d.
April	...	40 4	44 4	29 3	28 6	24 11 21 10
May	...	43 6	46 0	30 11	27 7	25 1 22 7
Berlin :		s. d.	s. d.	s. d.	s. d.	s. d.
March	...	40 5	44 7	—	—	24 11 22 6
April	...	41 6	44 8	—	—	25 6 22 4
Breslau :		s. d.	s. d.	(brewing)	(brewing)	s. d.
March	...	36 6	43 7	29 0 (brewing)	29 4 (brewing)	22 6 20 5
				23 5 (other)	27 9 (other)	
				29 0 (brewing)	28 6 (brewing)	
April	...	37 10	42 8	24 8 (other)	26 5 (other)	23 5 20 1

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets. The mark is now taken as equal to 11·8d., and the German prices for the former year have been recalculated on this basis.

AVERAGE PRICES of British Wheat, Barley, and Oats at certain Markets during the Month of May, 1907 and 1908.

	WHEAT.		BARLEY.		OATS.	
	1907.	1908.	1907.	1908.	1907.	1908.
London...	...	s. d.	s. d.	s. d.	s. d.	s. d.
...	...	29 2	33 4	24 7	25 2	20 10 19 5
Norwich	...	27 6	32 7	23 2	26 1	19 6 18 4
Peterborough	...	28 2	32 9	23 0	25 4	19 6 18 3
Lincoln...	...	27 11	32 9	23 3	25 4	19 9 18 4
Doncaster	...	27 11	32 2	25 0	26 2	20 2 18 3
Salisbury	...	28 3	32 8	23 7	26 4	19 11 17 9

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of May, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Bristol.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.						
BUTTER :—	s. d.	s. d.	s. d.	s. a.	s. d.	s. d.	s. d.	s. d.
British	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
...	12 9	11 6	13 6	12 0	—	—	14 0	—
per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery	110 0	107 6	113 0	111 6	108 6	106 0	108 0	—
" Factory	101 0	99 0	99 0	98 0	101 0	97 0	—	—
Danish	113 0	111 0	—	—	114 6	111 0	112 0	—
Russian	106 0	103 6	109 6	107 6	104 0	101 0	104 6	99 0
Australian	107 6	105 6	109 0	101 0	108 6	105 6	107 6	—
New Zealand	112 0	110 0	114 6	112 6	112 6	110 6	110 0	—
CHEESE :—								
British—								
Cheddar	76 0	74 0	74 0	64 0	74 0	70 0	58 0	56 0
Cheshire	—	—	—	—	120 lb.	120 lb.	—	—
Canadian	64 0	62 6	63 6	61 0	62 6	61 0	63 6	62 0
BACON :—								
Irish	62 6	57 0	—	—	62 6	55 6	62 0	57 0
Canadian	49 6	48 0	51 6	48 6	50 0	46 6	53 0	49 6
HAMS :—								
Cumberland	93 6	80 6	—	—	—	—	—	—
Irish	90 6	77 6	—	—	—	—	82 0	73 0
American (long cut)	50 0	49 6	48 0	45 0	50 0	45 6	50 0	48 0
Eggs :—	per 120.	per 120.						
British	9 2	8 4	8 1	—	—	—	—	—
Irish	8 2	7 7	7 9	7 3	7 4	6 11	7 9	6 7
Danish	8 7	7 11	—	—	8 4	7 4	7 10	6 9
POTATOES :—	per ton.	per ton.						
Langworthy	115 0	102 6	110 0	101 0	108 6	98 6	95 0	89 0
Main Crop	115 0	103 6	111 0	102 6	108 6	98 6	—	—
Up-to-Date	106 0	95 0	112 6	100 0	93 6	88 6	87 6	80 0
HAY :—								
Clover	94 6	83 6	74 6	—	92 6	65 0	78 6	73 6
Meadow	78 0	61 0	67 0	—	—	—	55 0	52 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	MAY.		5 MONTHS ENDED MAY.	
	1908.	1907.	1908.	1907.
Swine-Fever :—				
Outbreaks	344	370	899	1,045
Swine Slaughtered as diseased or exposed to infection ...	1,258	1,656	4,179	5,127
Anthrax :—				
Outbreaks	121	155	528	525
Animals attacked	141	210	707	719
Foot-and-Mouth Disease :—				
Outbreaks	—	—	3	—
Animals attacked	—	—	112	—
Glanders (including Farcy) :—				
Outbreaks	83	90	349	404
Animals attacked	258	243	1,175	955
Sheep-Scab :—				
Outbreaks	19	14	625	390

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	MAY.		5 MONTHS ENDED MAY.	
	1908.	1907.	1908.	1907.
Swine-Fever :—				
Outbreaks	30	" 9	93	57
Swine Slaughtered as diseased or exposed to infection ...	564	143	1,770	1,035
Anthrax :—				
Outbreaks	1	—	4	1
Animals attacked	1	—	7	3
Glanders (including Farcy) :—				
Outbreaks	—	—	—	—
Animals attacked	—	—	—	—
Sheep-Scab :—				
Outbreaks	16	12	261	159

SELECTED CONTENTS OF PERIODICALS.

Transactions of the Highland and Agricultural Society. Fifth Series, Vol. xx.

State Aid to Agriculture in Foreign and Colonial Countries, *W. E. Bear*; Heredity in Plants and Animals, Mendel's Principles and their bearing on Agricultural Problems, *T. B. Wood* and *R. C. Punnett*; Ventilation in Poultry Houses, *K. J. J. Mackenzie* and *E. J. Russell*; Progress in Poultry-Keeping, *A. M. Prain*; Rainfall Observations in Scotland, *A. Watt*; Farming Methods in Banffshire, *J. R. Barclay*; Buildings for Small Holdings, Prizes for Plans (*illustrated*); International Dairy Congress, *J. Speir*; Horses on the Farm, *A. S. Grant*; Milk Records, *J. Speir*; Botany for Students of Agriculture, *J. Percival*; Improvement of Hill Pasture as Determined by the Effect on Stock, Experiments in Scotland, Second Report, *J. Hendrick*; Insects of the Year 1907, *R. S. MacDougall*.

Journal of the Royal Horticultural Society, January, 1908.

The True Darwinism, *Rev. Prof. G. Henslow*; The Relation of Meteorology to Horticulture, *R. H. Curtis*; The Amateur and Horticultural Law, *H. M. Veitch*; Phyllotaxis, or the Arrangement of Leaves, *Rev. Prof. G. Henslow*; Mistletoe, *W. Smyth*; Natural Selection, *C. T. Druery*.

Journal of Economic Biology. 3. 1.

The Biology of *Polystictus Versicolor* (Fries.), *Jessie S. Bayliss*.

Transactions of the Surveyors' Institution. XL.

Parts VII and VIII.—The Small Holdings and Allotments Act, 1907, *W. G. S. Rolleston*.

Part X.—The Agricultural Education of the Land Surveyor.—*K. J. J. Mackenzie*.

Journal of the Department of Agriculture, Ireland, April, 1908.

The Farmer and the Labourer: a Talk with Farmers, *T. P. Gill*; Black Scab in Potatoes; The Use and Purchase of Manures; The Rearing of Chickens in Brooders, *H. de Courcy*; American Gooseberry Mildew.

Bulletin Mensuel de l'Office de Renseignements Agricoles, 1908.

Février.—Nouvelle évaluation du revenu de la propriété foncière non bâtie; La dépopulation rurale dans l'État de New York.

Avril.—L'industrie de la Fabrication des Machines Agricoles aux États-Unis; Les établissements d'enseignement agricole et de recherches scientifiques intéressant l'agriculture; Hongrie:—Mesures destinées à encourager l'agriculture.

Annales de la Science Agronomique. 3^e Serie. 1907. Tome I.

Les sols forestiers, *E. Henry*.

Zeitschrift für Forst- und Jagdwesen, 1908. 4.

Das Wachstum von Kiefern aus einheimischem und nordischem Saatgut in der Oberförsterei Eberswalde, *Dr. Dengler*; Einige Bemerkungen über Düngung im Wald, *Dr. Hornberger*.

Die Landwirtschaftlichen Versuchs-Stationen. LXVIII. 3 and 4.

Beiträge zur Physiologie der Ernährung wachsender Tiere. I. Ersatz von Vollmilch durch Magermilch mit und ohne Surrogate bei Saugkälbern, *G. Fingerling*; Versuche über die wechselseitige Impfung verschiedener Leguminosengattungen mit Reinkulturen von Knöllchenbakterien, *F. Nobbe*, *L. Richter*, und *J. Simon*; Weitere Untersuchungen über die wechselseitige Impfung verschiedener Leguminosengattungen, *F. Nobbe*, *L. Richter*, und *J. Simon*; Die Wirkung der organischen Stickstoff-Düngemittel im Vergleich zum Salpeter, *M. Popp*.

Zeitschrift für Pflanzenkrankheiten. XVIII. 2.

Über die Beeinflussung der Assimilationstätigkeit von Kartoffelpflanzen durch Bespritzung mit Kupferservitriolkalkbrühe.—*O. Kirchner*.

ADDITIONS TO THE LIBRARY.

[NOTE.—The receipt of *annual* publications of foreign agricultural and other departments, experiment stations and societies is not noted in the monthly list of additions to the Library, but a list of all such publications, which are regularly received, will be given from time to time.]

Africa—

Prossor, J. E.—Pig Feeding and Breeding in East Africa. (117 pp.) London : Uplands of East Africa Syndicate, Ltd, 1907. 2s.

Belgium—

De Caluwe, P.—Veldproeven op Variëteiten Aardappels. (88 pp.) Ghent : I. Vanderpoorten, 1906.

Canada—

Department of the Interior.—Atlas of Canada. (21 pp. and 83 plates.) 1908.

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Zuschlag, E.—Le Rat Migratoire et sa Destruction Rationnelle. (171 pp.) Copenhagen : L. A. Jørgensen, 1908.

Hansen, K.—Lucernen. (138 pp.) Copenhagen. Schubotzeske Forlag, 1907.

Russia—

Goulkevich, Col. N. A.—Types and Breeds of Horses in the Russian Empire. (66 plates). St. Petersburg : Golicke and Villborg. 1908. 20 roubles.

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Secrétariat Suisse des Paysans.—La Question Ouvrière Agricole en Suisse. 1^{re} Partie. La condition des ouvriers agricoles suisses autrefois et aujourd'hui. (135 pp.) Berne: Wyss. 1908.

United States—

Van Norman, H. E. First Lessons in Dairying. (98 pp.) New York, Orange Judd Co. 1908.

Department of Agriculture. Report of the Secretary, and Departmental Reports, 1907. (811 pp.) Washington, 1908.

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Bureau of Entomology :—Circ. 95.—The most Important Step in the Control of the Boll Weevil. (8 pp.) Technical Series, No. 12, Part V.—The More Important Aleyrodidae infesting Economic Plants. (89–94 pp.) Bull. 64. Part IV.—An Injurious North American Species of Apion, with notes on related forms. (29–32 pp.) Bull. 68. Part III.—The Trumpet Leaf-Miner of the Apple. (23–30 pp.) ; Part V.—The Lesser Apple Worm. (49–60 pp.) Bull. 72.—Information concerning the North American Fever Tick. (87 pp.) Bull. 73.—Studies of Parasites of the Cotton Boll Weevil. (63 pp.) Bull. 74.—Some Factors in the Natural Control of the Mexican Cotton Boll Weevil. (79 pp.) Bull. 75.—Part I. Production and Care of Extracted Honey; Methods of Honey Testing for Bee Keepers. (18 pp.) ; Part II. Wax Moths and American Foul Brood. (19–22 pp.) Washington, 1907–8.

Office of Experiment Stations :—Circ. 76.—Swamp and Overflowed Lands in the United States. (23 pp.) Circ. 77.—A Secondary Course in Agronomy. (43 pp.)

Bull. 191.—Tests of Internal-Combustion Engines on "Alcohol" Fuel. (89 pp.) Bull. 193.—Studies of the Effect of different Methods of Cooking upon the thoroughness and ease of Digestion of Meat. (100 pp.) Bull. 194.—A Review of Investigations in Soil Bacteriology. (108 pp.) Bull. 195.—

Simple Exercises Illustrating some Applications of Chemistry to Agriculture. (22 pp.) Washington, 1907-8.

Farmers' Bulletins :—No. 307.—Roselle: Its Culture and Uses. (16 pp.) No. 309.—Experiment Station Work, XLIII. (33 pp.) No. 310.—A Successful Alabama Diversification Farm. (24 pp.) No. 313.—Harvesting and Storing Corn. (29 pp.) No. 315.—Progress in Legume Inoculation. (20 pp.) No. 316.—Experiment Station Work, XLIV. (32 pp.) Washington, 1907-8.

Forest Service :—

Suggestions for the Disposal of Brush in the National Forests. (15 pp.)

Circ. 113.—Use of Dead Timber in the National Forests. (4 pp.) Circ. 114.—Wood Distillation. (8 pp.) Circ. 120.—Consumption of Pulpwood in 1906. (10 pp.) Circ. 122.—The Lumber Cost of the United States: 1906. (42 pp.) Circ. 123.—Production of Slack Cooperage Stock in 1906. (8 pp.) Circ. 124.—Consumption of Cross-Ties in 1906. (6 pp.) Circ. 125.—Production of Light Cooperage Stock in 1906. (12 pp.) Circ. 126.—Forest Tables—Lodgepole Pine. (24 pp.) Circ. 129.—The Drain upon the Forests. (16 pp.) Circ. 130.—Forestry in the Public Schools. (20 pp.) Circ. 131.—Practical Forestry on a Spruce Tract in Maine. (15 pp.) Circ. 132.—The Seasoning and Preservative Treatment of Hemlock and Tamarack Cross-Ties. (31 pp.) Circ. 133.—Production of Veneer in 1906. (6 pp.) Circ. 134.—The Estimation of Moisture in Creosoted Wood. (7 pp.) Circ. 136.—The Seasoning and Preservative Treatment of Arborvitæ Poles. (29 pp.) Circ. 137.—Consumption of Poles in 1906. (9 pp.) Washington, 1907-8.

Bureau of Plant Industry :—Bull. 107.—American Root Drugs. (80 pp.) Bull. 111.—Miscellaneous Papers—III. Imported Low-Grade Clover and Alfalfa Seed; IV. Forage Crops for Hogs in Kansas and Oklahoma; V. The Culture and Uses of Brome-Grass. (67 pp.). Bull. 113.—The Comparative Tolerance of Various Plants for the Salts Common in Alkali Soils. (20 pp.) Bull. 114.—Sap-Rot and other Diseases of the Red Gum. (37 pp.) Bull. 115.—The Disinfection of Sewage Effluents for the Protection of Public Water Supplies. (47 pp.) Bull. 116.—The Tuna as Food for Man. (73 pp.) Bull. 117.—The Re-seeding of Depleted Range and Native Pastures. (27 pp.) Bull. 118.—Peruvian Alfalfa. A new long-season variety for the South-West. (.5 pp.) Bull. 119.—The Mulberry and other Silkworm Food Plants. (22 pp.) Bull. 120.—The Production of Easter Lily Bulbs in the United States. (20 pp. + 4 plates.) Washington, 1907-8.

Bureau of Soils :—Bull. 47.—Certain Organic Constituents of Soils in relation to Soil Fertility. (52 pp.) Bull. 49.—The Action of Water and Aqueous Solutions upon Soil Carbonates. (64 pp.) Washington, 1907.

Bureau of Statistics :—Bull. 52.—Imports of Farm and Forest Products, 1904-6, by Countries from which Consigned. (58 pp.) Bull. 53.—Exports of Farm and Forest Products, 1904-6, by Countries to which Consigned. (68 pp.) Bull. 54.—Trade with Non-contiguous Possessions in Farm and Forest Products, 1904-6. (40 pp.) Bull. 55.—Meat Supply and Surplus, with consideration of consumption and exports. (100 pp.) Bull. 57.—Wheat Crops of the United States, 1866-1906. (35 pp.) Bull. 58.—Oat Crops of the United States, 1866-1906. (36 pp.) Bull. 59.—Barley Crops of the United States, 1866-1906. (36 pp.) Bull. 63.—Hay Crops of the United States, 1866-1906. (34 pp.) Washington, 1907-8.

[Books may be borrowed from the Board's Library on certain conditions, which may be ascertained on application.]

THE JOURNAL OF THE BOARD OF AGRICULTURE.

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JULY, 1908.

RUST IN WHEAT.

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One of the most characteristic features of modern agriculture is found in the universal attempts to grow the heaviest possible crops. Whilst the introduction of artificial manures has done much to increase yields, it has been realized that other methods are worthy of investigation. Consequently we find many farmers devoting much attention to the testing of different varieties of corn, clover, roots, &c., in the hope of finding some which will give larger crops under their conditions than the varieties generally cultivated in the district. For the benefit of those who cannot readily make such investigations for themselves, the various agricultural institutions scattered about the country conduct similar experiments. Within recent years the stress of competition has shown that even greater efforts must be made to secure the maximum yield.

The fact has steadily been forced upon the cultivator that the attacks of fungoid and insect pests are at times exceedingly costly. A field of swedes ruined by finger and toe, a crop of potatoes rotting through the attacks of potato disease, or an apple orchard infested with scab, form object lessons which are not readily forgotten. Although such diseases are not encountered every year in epidemic form yet no season passes without their being present and more or less severe. These minor attacks, though possibly not noticed at the time, mean in the aggregate a very serious loss to the grower. Modern

farming is now turning its attention to methods of coping with these pests, and where methods of doing so have been devised their application has become part of the routine work of the farm. The discovery of preventive or curative measures generally demands an exact knowledge of the life histories of the pests, and the study of parasitism is of too recent a growth for many to have been investigated in sufficient detail. In consequence there are still numbers of fungi whose ravages are unchecked year by year simply because we have no means of attacking them. Foremost amongst these are the rusts of the cereals. The necessity for investigating this group of parasites and determining what means can be adopted for dealing with them becomes evident when one knows that Prussia alone lost some £20,000,000 in one year through their attacks.

We have, in this country, no reliable statistics of the losses due to the cereal rusts. In fact one cannot help thinking that many farmers look upon the parasite as part of the plant itself, for otherwise it is difficult to explain the fact that in a series of returns obtained from all parts of the country with the object of obtaining such statistics many stated that they had not seen rust or mildew on their crops.

The investigations of Eriksson, Marshall Ward and others during the last decade have added greatly to our knowledge of the life history of these parasites and shown that the problem of dealing with them is not so hopeless as it was considered to be a few years previously. Eriksson's work in particular has brought out a fact of fundamental importance. He has proved that such a rust as *Puccinia graminis*, the black rust of wheat, though occurring on a large number of the wild-growing grasses cannot pass from these to wheat. If spores are taken from wheat they fail to bring about disease if applied say, to cocksfoot, and *vice versa*. This same specialization of the fungus to particular host plants is found amongst other species of rusts. The common yellow rust of wheat, *Puccinia glumarum*, though occurring on wheat and barley cannot pass from the one host to the other. There is one "variety" of it which has specialized for wheat and another for barley, and though identical in all external respects there is some physiological difference between them which determines which host

plant they can flourish upon. A knowledge of this fact is of great value, for it shows that the spread of rusts from one crop to another need no longer be taken into consideration when attempting to check the progress of one of these parasites. For all practical purposes one might as well expect potatoes to become attacked with apple canker as wheat to be infected with the rust from barley.

Undoubtedly the most important species of rust in this country is the yellow rust, *Puccinia glumarum*. This appears without fail each season, in some years in such abundance that the whole of the foliage and even the ears and grain become coated over with its orange-yellow spores. The black rust, *Puccinia graminis*, is often stated to be the common rust of the country, particularly by writers to the popular press. As a matter of fact it is so rare, at all events in the eastern counties, that in most seasons I have failed to find it amongst standing crops, and in order to obtain material for teaching purposes and investigation, special crops of it have had to be grown by artificially infecting late sown wheats. In many other parts of the world, in Canada, the United States, the Transvaal and Australia, for instance, this species is the prevalent rust, and its attacks are so virulent that the crops occasionally fail completely. It is thus a matter to be thankful for that this species is comparatively rare here.

The life history of the yellow rust appears to be more simple than that of many other species. It is generally first noticed in some abundance in the early spring, though in some seasons it does not put in an appearance in quantity until late in May. Then small yellow patches, about one-sixteenth of an inch across, are found scattered about on the foliage. Under favourable conditions these increase in number with great rapidity, often becoming confluent and forming long narrow stripes. Each patch then becomes powdery on the surface owing to the breaking of the skin of the leaf and the setting free of myriads of orange coloured spores known as "uredospores." Any one of these which comes into contact with the leaf or stem of a healthy plant may bring about infection and produce a fresh crop of thousands of new uredospores in the course of some 10 days. Any one of these new spores may in turn repeat the process, so that it is possible for even a single fleck

of the disease to prove the starting point of an epidemic. Later in the season, as the plants are beginning to mature, the formation of uredospores ceases and small blackish patches are formed under the skin of the leaf or stem. These are the teleutospores. In the case of the black rust, the teleutospores remain dormant through the winter months and germinate in the following spring to give rise to fresh spores which infect, not wheat, but the young foliage of the barberry, the spores which are then produced on this host plant ultimately infecting wheat and producing black rust on it once more.

No alternate host plant is known in the case of yellow rust, and it is probable that the fungus does not require one to complete its life cycle. Thus the cutting out of barberry, so often recommended for the prevention of rust, is superfluous where the yellow rust alone has to be dealt with. The uredospore stage seems to be sufficient to enable the fungus to tide itself over the winter, for it is possible to find pustules of rust on the foliage of self-sown wheat or sometimes on the ordinary autumn-sown crop even in the depths of winter. The twisted leaves lying on the soil form a series of sheltered moist chambers on the inner surface of which the rust pustules are occasionally present in great numbers. These may develop with rapidity in the early spring, and at times as early as March the whole of the plant's foliage may be yellow with the rust. The winter's cold does not appear to injure these spores, for they germinate readily when brought into the laboratory, and there can be little doubt that they serve to start the epidemic in the spring, when conditions become favourable for infection. Under these circumstances it is not necessary to assume that the first appearance of the fungus in any season is dependent upon its being actually present in the embryo of the grain, spreading therefrom as the plant develops, and ultimately producing its spores when the external conditions are favourable.

The actual effects of yellow rust on wheat have received little attention from the economic point of view, though we are familiar enough with them from the botanical stand-point. It is, however, sufficiently obvious that diseased plants cannot produce a full crop of grain. The greater portion of the fungus is deeply imbedded in the host plant, growing chiefly

in the numerous airspaces in the foliage leaves. By pushing out small suckers or haustoria into the actual cells of which the leaf is built up it drains the tissues of foodstuffs, but it does not kill them immediately, as, for instance, the fungus causing potato disease kills the leaves of the potato. The normal functions of the leaf system are thus interfered with considerably, and infected plants cannot elaborate so great a supply of carbohydrates, proteids, &c., as healthy ones. When the time comes for the developing grain to draw upon the plant's reserve of foodstuffs it can only obtain a small supply. One of the results of this is seen in the shrivelled grain produced by a diseased crop, which is often so light that a large percentage is blown out whilst the grain is being cleaned. At the same time the straw is discoloured by the dark masses of teleutospores and it suffers in weight and texture.

All attempts to cope with these rust epidemics have proved fruitless, and at present there seems little likelihood of satisfactory remedial measures being discovered. Under these circumstances the method suggested a century ago by Knight seems the only practicable one, namely, to breed varieties which shall be resistant to the attacks of this rust. The experiments described below were planned to test the possibility of this.

The fact is well known amongst those who grow a number of kinds of one and the same crop that when disease puts in an appearance some suffer far more than others and some may prove almost completely disease-free. This suggests that disease-resistant varieties should be searched for and propagated in preference to susceptible varieties. Efforts have been made to do this with certain crops, such as the potato, and the sustained attempts to find a disease-resisting variety have met with a certain amount of success which augurs well for the future. Where such experiments are carried out a difficulty generally arises just when success seems within the experimenter's reach. The variety when found, though perhaps excellent as a disease resister, may be deficient in other essential respects. It may not, for instance, give sufficiently large crops or the quality of the crop may be unsatisfactory, a failure in either of these respects being sufficient to condemn the variety from the point of view of

the man who has to grow the crop at a profit. An example of such a case is provided by the Evergood potato ; it is very resistant to the attacks of potato disease, yet it shows no signs of supplanting the exceedingly susceptible Up-to-Date, chiefly because of the indifferent quality of the tubers.

The possibility then has to be considered whether this feature of disease resistance, when found, can be combined with other good features by crossbreeding. Until the opening years of this century there was little chance of accomplishing this owing to the fact that our knowledge of plant breeding was too slight. Still many breeders had set themselves the task of raising disease-resisting plants of various kinds, and it is curious to note how confident breeders have always been that they would succeed in the long run. Their opinion was based upon the fact that the descendants of a hybrid plant were frequently very unlike the parents and one another. Many of these were obviously useless, yet some few might show improvements on the plants used as the parents of the hybrid. Amongst them they hoped to find some showing the feature of disease resistance. The finding of the required type was thus a matter of chance, but so fascinating is the subject that men have been found to spend the greater part of their days working on in the hope that success would come in the near future.

Within the last few years, the problems of breeding have been investigated in great detail, and it is now known that certain definite laws underlie the phenomena which, till recently, appeared hopelessly complex. The "breaking of the type," seen when the descendants of the hybrid were raised, is now seen to be so simple a matter that in many cases it is possible to predict with extraordinary accuracy not only just what types will appear but even the numbers of them.

The laws discovered by Mendel have been confirmed time after time, and they are now recognised as being of very general application. As a direct result of a knowledge of them a definite system has been introduced into breeding, and now instead of blindly crossing varieties in the hope of obtaining a desired "break," the breeder can make his choice of plants knowing that he can combine the features occurring in them in any fashion he wishes and further obtain his new varieties

in so stable a condition that they will never "throw back" to the parent forms. An elementary example may illustrate the possibilities now open to the breeder. Given a dwarf marrowfat pea and a tall round seeded pea, from these he can obtain tall marrowfat and dwarf round seeded peas in a perfectly fixed condition in three seasons at the most.

The details are too complex to describe here,* and we need concern ourselves only with a description of some experiments designed to test the possibility of applying Mendelian principles to the breeding of disease-resisting varieties of wheat. At the outset it was necessary to find varieties already possessing this characteristic. For this purpose a large collection of wheats was obtained from various parts of the world and records were made as to their susceptibility to rust at intervals throughout the growing season. Those varieties which proved liable to rust were rejected, and the remainder were again tested in the following seasons. As a result of these tests some half-dozen varieties have been found amongst the three hundred grown which are either very slightly susceptible or completely immune to the attacks of yellow rust. The most important of these are Einkorn, Little's Anti-mildew, and "Club wheat." Einkorn is said to be a primitive type of wheat. It produces small flat ears, at first sight not unlike those of a small Goldthorpe barley. The grain is not set free from the chaff on thrashing, but the stalk of the ear breaks into fragments much as barley does. In general habit the plant is small and tufted. From the English agriculturist's point of view the variety is obviously worthless as wheat. Little's Anti-mildew is a variety of considerable interest, as it represents one of the first attempts to cultivate a disease-resisting crop. References to the literature of half a century ago show that this wheat was valued because of its capacity of resisting the attacks of rust, then described, as it still frequently is, as "mildew." Although, I believe, practically extinct in most parts of the country, it still survives on a small scale in some parts of the fen country in East Anglia. "Club" wheat is a closely set variety found in a plot of Northern Duluth wheat by Mr. A. E. Humphries. Its local name is unknown to me.

* For details see "Mendelism," by R. C. Punnett. (Macmillan and Bowes.)

These varieties have been tested season by season by growing them in alternate rows with the most susceptible varieties which could be found. They have thus been surrounded by quantities of rust and have had every opportunity of becoming infected. In these open air trials, Einkorn and "Club" have remained perfectly free from disease, whilst Little's Anti-mildew has only shown a few of the characteristic flecks of yellow rust. Further, these varieties have been grown under exceedingly unfavourable conditions in the laboratory, and the spores of yellow rust applied to them without producing more than the slightest symptoms of disease. In some cases small yellow patches appeared on the foliage where the rust spores had been applied, but these patches failed to produce crops of viable spores. For all practical purposes then we may speak of these varieties as immune to the attacks of yellow rust.

These and also a few others have been crossed with susceptible varieties in order to determine whether this feature of rust resistance is a unit character comparable, for instance, with dwarfness or tallness in the case of the peas already quoted.

The clearest results are those afforded by a cross between "Club" wheat and Michigan Bronze. This latter variety was chosen as a parent solely because of its extraordinary liability to the attacks of yellow rust. Under our experimental conditions it is one of the first to show signs of rust, and by the time the ears are pushing through the sheaths the foliage and stems are as a rule so covered with rust pustules that one can hardly distinguish the normal green colouring of the plant. The rust then spreads to the ears, covering the chaff, the beard and the grain more or less completely. As a rule the attack is so severe that the plants fail to set any grain capable of germination. Michigan Bronze differs from "Club" wheat in producing lax or loosely set ears. Previous experiments had shown that laxness and denseness of the ears were unit characters. If, then, as the result of this crossing, varieties (1) similar to Michigan Bronze in ear shape but immune to the attacks of yellow rust, and (2) similar to "Club" wheat but liable to the attacks of rust, could be obtained, immunity and susceptibility to rust would also be unit characters.

If so, we might loosely describe the results as transferring immunity to Michigan Bronze and susceptibility to the "Club" wheat.

The crossbred plants proved to be very susceptible to yellow rust, for their foliage and even the ears were as badly attacked as the Michigan Bronze growing alongside. They could be distinguished from the latter by the shape of the ears, which were not so lax, though they were not so dense as those of the "Club" wheat. In spite of the severity of the attack these plants produced a fair crop of grain, the vigour generally associated with hybrids being in their favour. From this over 2,000 plants were raised in the open and several hundred in pot cultures for demonstration and experimental work in the laboratory. The plots growing in the open were badly diseased by the end of May (1906). A close inspection of these showed that there were many plants completely free from the parasite. Even when the dying leaves at the bases of the plants were examined no signs of it could be found. Such plants were kept under almost daily observation until ripening time, and they were found still to retain their capacity to resist the attacks of yellow rust. To anyone who saw the plots it was inconceivable that the plants which remained immune did so owing to lack of opportunity of becoming infected, for the rust-coated leaves of contiguous plants were blowing against them and frequently coating them with powdery masses of spores. In fact, so much rust was present that the surrounding soil was coloured by it. The descendants of the hybrid plants then were of two sorts, one liable to, and the other immune to, the attacks of yellow rust. Between the beginning of June and the middle of July a statistical examination of the plots was made with the object of determining the proportions of these two classes. If susceptibility and immunity were a pair of unit characters, then it was known that there should be on the average three of the rust-susceptible plants present to each rust-immune individual.

The result was that 1,609 of the former and 523 of the latter were found, a close approximation to the expected proportion of three to one.

Previous experiments made with wheats with similarly shaped ears to those used as parents in this case had shown

that three distinct types would be present in this generation, namely :—

- (1) With dense ears, similar to the parent "Club" wheat.
- (2) With an intermediate ear-shape resembling that of the hybrid.
- (3) With loosely set ears like those of Michigan Bronze.

On taking this feature into consideration, as well as the behaviour of the plants to the attacks of yellow rust, it was found that each of the three types was composed of plants showing either susceptibility or immunity to yellow rust. In the original parents immunity was associated with denseness of the ears and susceptibility with laxness, but in this generation there were susceptible as well as immune samples of "Club" wheat and also immune and susceptible examples of a wheat similar to Michigan Bronze in the shape of the ear.

Immunity and susceptibility to the attacks of yellow rust then may be treated as unit characters, since they may be obtained in combinations differing from those in which they occur in the original parents. To any one with any experience of modern plant breeding the problem was solved at this stage, and it was evident that the breeder could build up disease-resisting varieties "to order." Nevertheless, to test the matter further, another generation was grown to determine whether each of the new types was fixable in accordance with Mendelian expectations. At this time it was known that the dense and lax types would breed true to these particular characters and that those with an intermediate ear shape were unfixable. From the experience already gained from a study of the generation raised from the hybrid, it was foreseen that the immune types also would breed true to this particular feature, whilst on the average only one in three of the susceptible plants could be relied upon to produce only susceptible plants, the remainder giving a mixed offspring.

Individuals showing such combinations of characters as immunity to yellow rust and loosely set ears, or immunity and densely set ears, should therefore breed true from the outset. Tests made with a considerable number of individuals showed that this was the case without exception. The sowings from susceptible plants in some cases bred true to this character, and in others produced a number of immune plants as well,

the proportion of immune to susceptible plants in such cases being again as one in three.

In this generation then there were four fixed types of wheat :—

Immune "Club" wheat.

Susceptible "Club" wheat.

Immune lax-eared similar to Michigan Bronze.

Susceptible lax-eared similar to Michigan Bronze.

Two of these resemble the parents, two show fresh combinations of the characters present in the parents. Further trials are being conducted with these varieties in order to demonstrate that these new character combinations are perfectly fixed. That they are so is predictable, and as a matter of fact large trial plots containing tens of thousands of individuals have been raised from somewhat similar crosses in which no "reversions" to the parental forms could be found.

Those cultures from the susceptible wheats which produced a percentage of immune plants but were otherwise fixed proved of some further interest, for they provided a unique case of plants of the same kind growing under the same conditions but some attacked by rust and others rust free. The opportunity was therefore taken to obtain an estimate of the extent of the damage caused by the disease. Numbers of each type were harvested separately. The yield of grain of the diseased plants compared with those in a healthy condition was in the ratio of 0·2 to 1. The result, whilst undoubtedly far greater than occurs in ordinary farming practice, will serve to show how costly the cultivation of extremely susceptible varieties may prove to the farmer.

Determinations of the weight of the straw of diseased and healthy crops were then made by weighing an equal number of stems of the same length of each. The ratio of the weight of the diseased straw to that of the disease free proved to be as 1 in 2·5. The physical characters of the infected and immune straw were strikingly dissimilar. In the case of the former the surface was dull, the colour a dingy grey, and the texture was soft and spongy. The straw of the immune types, on the other hand, was a clean yellow colour, and the surface was highly lustrous; the separate stems were rigid and did

not break readily. These differences in the straw are of considerable importance for there can be little doubt that the weakening of the straw by the attacks of rust is largely associated with its lodging under unfavourable weather conditions. For instance, in the fen country it may often be noted that the first parts of a field to lodge are those where the rust is thickest. Further, in the numerous variety trials made in the course of these experiments, the most susceptible wheats have always been the first to be beaten down in stormy weather. This fact probably explains the survival of Little's Anti-mildew in the fen country. There, where all the conditions are in favour of the crop becoming laid, there is a great demand for a stiff-strawed wheat which will give the farmer more opportunity to cut the crop with a binder. The property of rust-resistance means that the strength of the straw is unimpaired, and in spite of other defects this feature has proved so valuable that it has probably been the deciding factor in retaining this variety.

The experiment just described offers some hope of more rational methods of coping with plant diseases coming into use. At present the use of fungicides is practically the only method the cultivator has at his disposal. This is costly, particularly when the operation has to be repeated time after time owing to the fungicides being washed off by rain. Further, it often happens that spraying does not prove altogether efficacious. If, then, it can be shown that other diseases besides yellow rust can be brought under the control of the plant breeder, in the course of time we may expect to see disease-resisting varieties of most of our staple crops raised. There is already evidence in existence indicating that this is the case, for a similar series of trials on the inheritance of immunity to the well-known white mildew of barley has given almost identical results.

The immune varieties of wheat which have been raised in the course of these preliminary experiments have no particular value beyond their immunity. Numbers of crosses have, however, been made from which varieties suitable for general cultivation will be produced, and now that the main outlines of the story are clear there should be no difficulty in raising these in sufficient quantity for distribution in the course of a few seasons.

The question has frequently been asked by visitors to the experimental farm attached to the Cambridge University Department of Agriculture whether these immune varieties will prove of value in such countries as Canada and Australia, where there is a great demand for rust-resisting wheats. Taking into consideration what little evidence there is in existence it seems safe to say that they will be worthless. In those countries they would be exposed to the attacks of other species of rusts, and it by no means follows that because a variety is resistant to one kind it is to all. In fact there is every possibility that the varieties raised from "Club" wheat will prove extremely susceptible to the attacks of black rust, immune though they are to yellow rust. No opportunity has yet offered to test this point satisfactorily, but the parent has proved very susceptible to this rust when grown in the Transvaal and also in Canada, and small pustules of it have appeared on the hybrid descendants in this country from time to time. The term rust-resistant must then be used in a more limited manner than is usually the case and a statement as to what particular kind of rust is referred to added to it.

When one remembers that every country has its special needs with regard to such features as drought-resistance, early maturation, &c., there can be no question that each will have to solve its own problem of building up ideal rust-resisting varieties.

THE COST OF PRODUCING BEEF IN WINTER.

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The problem of the true cost of producing beef has long exercised the minds of agriculturists. Not only has it been frequently discussed in the leading agricultural journals during the past half century, but still earlier references to the question may be found in the "Communications" published by the Board of Agriculture between the years 1800 and 1812.* (*See footnote on next page.*)

Cost of Feeding.—The first point to be ascertained is, what live-weight is gained during the feeding of animals put up to fatten. Mere "opinions" or "beliefs" have to be ignored,

for experience has shown that these are as unreliable as some of the "guesses" given at the "block-tests" competitions. I have before me the figures for four sets of trials, two of which were held in Norfolk in the winters of 1896-97† and 1897-98, and two in the East Lothian in the winters 1904-05 and 1905-06.‡ In these four feeding trials we have 106 animals of the Irish Shorthorn class from two to three years old, all fed on farms by "practical" feeders, and I find that the average time taken to put on 2 cwt. is 16 weeks, or 1 stone of 14 lb. live-weight *per week*. To check these figures I have

* A Norfolk feeding trial (given in "Communications to the Board of Agriculture on Subjects Relative to the Husbandry and Internal Improvement of the Country," Vol. VII, Part I") is full of interest, for it enables us to compare the methods of to-day with those of our forefathers. The question at issue was how much might be allowed per bushel for carrots when converted into beef. The results are reproduced in the following table:—

Norfolk Feeding Experiment, 1810, carried out by Robert Burrows, Esq., Weasenham, Nr. Rougham.

Lot.	Number of Bullocks.	Ration.	Gained (+) or Lost (-) in first 4 weeks.	
			Total.	Each Beast.
I	2	{ 5 lb. straw. 204 " turnips.	{ + 5 13	{ 1 13 4 0
II	2	{ 5 " straw. 149 " swedes.	{ + 6 3	{ 2 3 4 0
III	2	{ 5 " straw. 92 " mangels.	{ + 5 1	{ 3 11 1 4
IV	2	{ 5 " straw. 142 " carrots.	{ + 9 5	{ 5 3 4 2
V	2	{ 22 " straw. 3 3½ " molasses.	{ - 1 1	{ 0 3 0 12

Recapitulation.

Lot I ate 11,143 lb. turnips, gained 83 lb. Beef at 9d. per lb. Paid for turnips, 3½d. per bushel of 53 lb.

Lot II ate 8,374 lb. swedes, gained 87 lb. Beef at 9d. per lb. Paid for swedes, 5½d. per bushel of 53 lb.

Lot III ate 5,143 lb. of mangels gained 71 lb. Beef at 9d. per lb. Paid for mangels, 8½d. per bushel of 67 lb.

Lot IV ate 7,949 lb. of carrots, gained 131 lb. Beef at 9d. per lb. Paid for carrots, 8d. per bushel of 54 lb.

Lot V lost 15 lb. Beef at 9d. + 187 lb. molasses at 3½d. per lb., + 1,136 lb. straw £1 2s., + cutting straw = £4 11s. 9½d.

† Cambridge and Counties Agricultural Education Scheme. First Annual Report, by Professor T. B. Wood.

‡ Edinburgh and East of Scotland Agricultural College. Reports by W. Bruce, B.Sc.

gone through some trials carried out between the years 1895 and 1902 by the Royal Agricultural Society of England at Woburn, and find that in seven trials, including 74 animals—Hereford, Homebred, Irish Shorthorns and Blue-greys—this figure of 16 stone, or 2 cwts., in 16 weeks is upheld.

The next point is the cost of feeding. Taking the foods given in the Norfolk trials at present prices, I find that each beast would cost 7s. 4d. a week, made up as follows :—

An average of—		s.	d.
8 lb. of cake or cake and corn a day, 56 lb. a week, at £7 per ton	...	3	6
8 " hay and straw as "chop" a day, 56 lb. a week, at £2 per ton	...	1	0
112 lb. of roots a day, 7 cwts. a week, at 7s. 6d. per ton	...	2	6
Attendance (at actual cost in Norfolk)	...	0	4
Straw, not charged for	...	—	—
		7	4

As in the East Lothian experiments, the cost was rather under 7s., it will simplify matters if we take 7s. a week as the basis of our assumption, without charging for litter.

Now comes the difficult question of ascertaining what percentage of the live-weight is put on as carcase weight or beef. It is interesting to note that in the Norfolk experiments of 1810, given in the footnote on the previous page, the whole increase is taken as beef, but this is, of course, a mistake. Sir John Lawes,† writing to Mr. Stephens, says, that by very careful examination he came to "the conclusion that two-thirds of the increase of fattening stock was carcase." With the large and somewhat mature animals usually fattened by Norfolk, East Lothian and other "winter-grazing" farmers, I do not think this is enough.

I find that if you take fresh stores of 8 cwts. at 52 per cent. as given by Sir John Lawes in his tables, and make them become 58 per cent., or "fat," when weighing 10 cwts., 82 per cent. of the increase is carcase.‡ If again you take fresh stores of 10 cwts. as 52 per cent., becoming 58 per cent., or "fat," when weighing 12 cwts., the percentage is 88 per cent. These figures lead to the following results :—16 weeks' keep yields 2 cwts., or 224 lb., of live-weight ; 88 per cent. of 224 = 197 lb.

* Half hay, half straw at commencement, all hay at end of feeding period.

† *Bath and West of England Society's Journal*, 1898–1899.

‡ 58 per cent. is just over the 8–14 given by the butchers' stone of 8 lb. to the imperial stone of 14 lb.

carcase-weight, which, at 7s. per week, costs 112s. Therefore 1 lb dead-weight costs just over 6½d., or 1 stone costs 8s. This is not done with any but the very best stock, and it is much more likely that an 8 cwts. store yielding 52 per cent. would want to be taken to 10½ cwts. before attaining fatness enough to yield 58 per cent., which would make the percentage of carcase gain to live-weight 77 per cent. Gained, it must be noted, in over 20 weeks, which, as we shall see later is a much more expensive matter. But if, as is often the case, a farmer kept his store beasts till they were a little better than "fresh," that is about 54 per cent., before beginning to force them, there is every chance of the gain obtained in 16 weeks feeding being 75 per cent. carcase-weight. This is in the case of animals coming out at 58 per cent. when weighing about 11 cwts., or 51 stones of 14 lb., carcase, or 88 butchers' stones of 8 lb.

The following statement, therefore, represents what is likely to be the case in very many instances :—16 weeks' keep yields 2 cwts., or 224 lb., live-weight ; 75 per cent. of 224 = 168 lb. dead-weight, which, at 7s. per week, costs 112s., that is 8d. a lb. or 9s. 4d. a stone of 14 lb.

The above calculation is, of course, liable to many variations. It assumes careful selection of food-stuffs, proper housing, and a fairly competent man as feeder, but I would specially draw attention to the following points :—

Quality of Store.—Individuality or "quality" of store is most marked in the figures shown in Mr. Burrows' early experiments, as well as in the other trials, and a further example coming under my notice brings this out very forcibly. At Wye College in the autumn of 1906 two steers, (a) good and (b) poor, were used to demonstrate to the students the different "points" of value in selecting stores. The two animals were of the South Wales black-cattle type, of the same age, bred and reared on the same farm. (a) was by no means ideal ; he was, however, deep through the heart, with a decent flank and middle piece, good buttocks, a nice touch, and his disposition was that of a quiet feeding animal. The other animal (b) was by no means a "screw," but was higher on the leg, inclined to be tucked up, not kindly in the skin, and restless or nervous in character. They were both tied up in the same shed, and

treated in exactly the same way, except as regards feeding. The following statement shows the result of 60 days' feeding :—

(a).—Ration, 13 lb. of hay, 62 lb. of roots; daily gain, 1.87 lb.

(b).—Ration, 11 lb. of hay, 53 lb. of roots, and 7.5 lb. of cake and corn; daily gain, 1.53 lb.

That is to say, with a difference of about 6 lb. of cake in its favour (1 lb. of cake taken as equal to 1 lb. of hay and 9 lb. of roots), the low type of animal gained 18 per cent. less than the good quality one.

Length of Fattening Period.—A point very commonly ignored is that once the first three months or initial stage of feeding is passed, the longer an animal is on a fattening ration the greater the cost will be for every lb. of live-weight put on. The contrary view is very frequently held by practical feeders, who do not use the weighbridge, probably because the last few pounds put on show more than the first. The very pleasing appearance of a beast that is at that stage when he becomes more than first quality or "prime" is very noticeable and attractive to those interested in the feeders' art. Tables I and II, taken from the reports published by Mr. W. Bruce of the East of Scotland Agricultural College, help to illustrate the point :—

TABLE I.—Average Monthly Increase per Lot of 8 Cattle, 1905.

Periods of 28 Days.	Lot I. Decorticated Cotton-Cake.	Lot II. Egyptian Cotton-Cake.	Lot III. Bombay Cotton-Cake.
1st Period .. .	Lb. 63.3	Lb. 73.0	Lb. 70.7
2nd , , .	72.1	61.7	12.6
3rd , , ...	72.7	72.6	97.7
4th , , ...	31.3	44.0	57.4
5th , , .. .	30.7	41.7	52.7
Average daily increase per head }	1.93	2.07	2.07

In the different lots shown in the above table and in the table on the next page, the quality or the quantity, or both quality and quantity, of concentrated food was increased towards the end of the feeding trial. In searching the feeding trials held by the Royal Agricultural Society of England at

TABLE II.—Average Monthly Increase, 1906.

Periods of 28 Days.	Lot I.	Lot II.	Lot III.	Lot IV.
1st Period ...	Lb. 88·62	Lb. 81·75	Lb. 65·37	Lb. 76·62
2nd „ „	68·75	35·75	67·75	75·00
3rd „ „	50·50	61·50	69·25	57·75
4th „ „	25·37	47·37	59·50	32·50
5th „ „	40·00†	81·50†	—	—
Average daily increase per head }	1·78	1·75	2·02	2·05

† In these two cases some of the more forward bullocks had been removed, leaving those that had been kept back at first to finish.

Woburn between the years 1884 and 1902 I have only found one instance contradicting this principle. The following figures, the result of a feeding trial in 1889-90, bring the fact out very forcibly indeed* :—

6 beasts.	Average daily gain.	6 beasts.	Average daily gain.
First period—40 days.			
Ration—			
Cake,* 7·4 lb. ...		Cake,* 3·7 lb. ...	
Hay, 12·4 lb. ...	3·87 lb.	Hay, 14·32 lb. ...	3·18 lb.
Roots, 40·5 lb. ...		Roots, 43 lb. ...	
Second period—41 days.			
Cake,* 8·97 lb. ...		Cake,* 4·48 lb. ...	
Hay, 14·19 lb. ...	3·5 lb.	Hay, 15·74 lb. ...	2·56 lb.
Roots, 40 lb. ...		Roots, 45 lb. ...	
Third period—29 days.			
Cake,* 10 lb. ...		Cake,* 5 lb. ...	
Hay, as before ...	2·20 lb.	Hay, as before ...	1·63 lb.
Roots „ „		Roots „ „	

* Linseed and decorticated cotton, equal parts.

Professor Henry in his well-known book on "Feeding" publishes the following table illustrating the point :—

Cost of Gain increases with Length of Fattening Period.

	Feed for 100 lb. gain.				
Up to 56 days	730 lb.
„ 84 „ „	807 „
„ 112 „ „	840 „
„ 140 „ „	901 „

In the following, from the report of Professor Wood's Norfolk Experiments, I have taken the weekly gains over the two periods, and have attached to them the cost of each successive gain in live-weight at present-day prices :—

* *Journal of R.A.S.E.*, 3rd Series, Vol. I, Part II, p. 399.

TABLE III.—Cost of Gain.—Increases with Length of Fattening Period.

Period.	Gained per Week.	Cost per Week.	Cake per Week.	No. of Beasts.	Winters.	Cost per 14 lb. Increase.
	Lb.	s. d.	Lb.			
1st month	13·9	6 6	42	60	{ 1896-97 1897-98 }	6 6½
2nd „ „	13·6	7 4	56	60		6 7½
3rd „ „	17·1	8 2	70	60	„	5 9½
4th „ „	7·4	8 2	70	60	„	10 6
5th „ „	5·5	8 2	70	30	1896-97	17 9

The result in the last week is perhaps too bad to be applied generally, as it is only one winter's trial. We may assume that the increase of carcase-weight in gain of live-weight will have risen to 80 per cent., as a bullock fed for 20 weeks will be riper than one, which, as in the previous calculation, had only been fed for 16 weeks. Taking then the figures in Table III slightly modified as a basis, the following statement may be given:—20 weeks' keep yields 18 stone, or 252 lb., live-weight; 80 per cent. of 252 lb. gives 201 lb. dead-weight, which at 7s. 3d., costs £7 5s. or just over 8½d. per lb., or 9s. 1½d. per 14 lb. If we assume that the increase in live-weight yields 88 per cent. of carcase, it will cost just over 7½d., or 9s. 1d. a stone.

Price of "Stores."—We now come to the most salient point of all: the price paid for the store cattle put up to fatten. It has been put on record* by Messrs. Albert Pell, McJannett, and Clare Sewell Read that in their opinion stores are often bought at more per cwt. live-weight than they realise per cwt. as fat beasts. Observation leads one to endorse that view. Moreover, the cost of beef will be greater than the estimates given unless the carcase-weight of the store beast is bought at the same price as the fat bullock makes for beef. The following statement shows what a feeder may pay for the carcase-weight of a lean store if he gives the same price per cwt. live-weight for a store as he receives for the fat bullock:—

* R.A.S.E. Journal, 1889, "On Weighing Live Stock," by A. Pell, 1902; The Farmer and Stock-Breeder, "The Margin of Profit between Store and Fat Cattle," by J. D. McJannett; Bath and West Journal, 1896-1897, "Store Stock," by Clare Sewell Read.

Store, weighing 10 cwt., bought at £17 or 34s., per cwt. live-weight = 50 per cent. carcase, and yields 40 stone at 8s. 5½d. Fat bullock, weighing 12 cwt., sold at 34s. per cwt., or £20 7s. 6d. live-weight = fat 58 per cent. carcase, and yields 55 stone 10 lb., at 7s. 4d.

Having bought in the first case 40 stone at 8s. 5½d. and sold it at 7s. 4d., he must repay himself 40 times 1s. 1½d., or £2 5s., before he can realize the full value of the increased carcase-weight.

* *Farmyard Manure.*—The farmyard manure left by the feeding bullock has now to be taken into consideration. For with beef so often selling at 7s. 6d. or even 7s. per stone of 14 lb., it is obvious that only too frequently the dung has to pay a very big balance between the cost of producing and the receipt from the sale of winter beef.

An old-fashioned, and I have found a sound, way of estimating the amount of dung made is to take the weight of straw supplied to the animal as litter and multiply that amount by four. An animal in a box will require, to keep him comfortable and at the same time absorb the urine voided, some 12 lb. a day; in an open yard 56 lb. may be trodden down; 6 to 8 lb. will do in a stall and 20 lb. in a covered yard. Taking 28 lb. as a mean, it may be assumed that the average bullock makes 1 cwt. a day, or say, roughly, 1½ tons per month. Assuming that ½ cwt. of live-weight for beef has been produced at a cost of 28s., without charging for straw used as litter, and yields 75 per cent. of carcase-weight or 3 stone of 14 lb. at 7s. 6d., we find that this 1½ ton of dung costs the difference between 22s. 6d. and 28s., or 5s. 6d. If a more favourable price is made, that is to say, if the carcase-weight realises over 7s. 6d. a stone, or if a higher percentage of the live-weight is beef, it costs less. On the other hand the estimate is too low if the feeding bullock has not been got ripe enough with 16 weeks feeding to sell, or if the store has been bought at a greater price per stone of carcase-weight than the beef is sold at, or if less than 1·5 ton of dung can be made by the fattening bullock in a month. In practice we fear that the debit balance to beef is often very great, and in one instance, that of a hop-grower, known to me personally, no less than 8s. 6d. per ton had to be allowed for dung before the account would balance; and in this case as in previous examples no charge was made for straw for litter.

FOOT-ROT OF SHEEP.

There has been, and still remains, amongst flockmasters, shepherds and others a good deal of diversity of opinion as to whether foot-rot of sheep ever constitutes a contagious disease, *i.e.*, a disease communicable from a diseased sheep to a healthy sheep or not.

This difference of opinion appears to be mainly due to the fact that almost any diseased condition affecting the feet of sheep, associated with lameness, is usually classed under the general and ambiguous term foot-rot, and in that way non-contagious affections of the feet of sheep causing lameness have supported the view of some observers that foot-rot of sheep is not a contagious disease.

Non-contagious Foot-sore.—It is important to recognise that in a flock of sheep several animals may be simultaneously lame from injury to the feet, and the disorder show no tendency to spread through the flock. Such a condition, however, is not true foot-rot, although the injured feet may present ugly sores. It would be better described as foot-sore.

The non-contagious form, or foot-sore, which is due to injury to the foot, has its starting point usually in the horn itself. The horn may be decayed, broken, cut or bruised, and through the opening in the horn, soil and filth gain an entrance and set up inflammation of the sensitive structures of the foot, from which pus is usually discharged.

Among the conditions which predispose to this form of foot-sore may be mentioned the continual grazing of sheep on low-lying marshy pastures where the grass is long, particularly during prolonged wet seasons; and neglect of attention to trimming the horn, which under such adverse conditions becomes overgrown, gives an uneven treading surface, and is very liable to become soft and even decayed. Injuries may be inflicted by the animal stepping on sharp or rough objects, such as sharp stones, glass, nails, thorns, &c., and by over-trimming of the feet. They may also arise from travelling sheep for long distances on hard roads, or from anything which causes a breach in the horny foot, or bruises the sensitive foot, especially when the horn is worn or thin.

Symptoms.—The non-contagious foot-sore is the commoner condition met with, and it is not unusual to find one or more

sheep in a flock affected. Although lameness may not be a marked symptom from the first, yet it is usually the first indication to the shepherd that there is anything the matter with the foot, and by this time, in such cases, the lameness denotes that inflammation and suppuration have set in.

It will be observed, with perhaps rare exceptions, that in this non-contagious affection the disease has commenced at or near the under surface of the foot, and that the destructive process extends from below upwards. If pus forms and remains imprisoned within the horny box it will burrow and work its way towards the softer structures of the coronet as a way of exit, because the softer structures offer the least resistance to its progress. The foot becomes swollen round the coronet; it is hot and tender, and one or more small abscesses may appear on the coronet or at the heels. These abscesses burst, and discharge thick pus, which is frequently mixed with a little blood. The parts may continue to discharge pus, or they may heal up, but even when the outer wound is apparently healing and is closed by a layer of coagulated exudate on its surface, the pus may again be imprisoned, with the result that abscesses appear at other parts of the coronet. Providing there is an exit for the pus at the lower surface of the foot these secondary abscesses will not occur, since the pus, as it is formed, is continually discharged from the orifice, which affords a natural drainage to the matter within the foot. If after the injury an outlet through the horn remains for the escape of pus, the case may recover in a few days without any treatment. On the other hand, if the breach in the foot is too small and does not allow for the free escape of the pus, suppuration continues. Granulation tissue and new horny material are formed, and the former grows out from the sensitive parts in the form of what is commonly called proud flesh, from which a continual discharge oozes. The sore bleeds easily, and the foot becomes distorted.

Treatment.—In many cases of this affection by carefully trimming the foot, cleansing the wounds with antiseptics, applying a dressing if necessary, and removing the affected sheep to drier pastures, the cases promptly recover. In those cases where the injury has been aggravated by extensive suppuration the feet require careful and repeated individual attention. It will be found that although the non-contagious

affection is the commoner, it usually affects only a comparatively few animals in a flock, unless they have all been subjected to like conditions. There is no evidence of the spread of contagion from sheep to sheep, and frequently only one foot is affected.

Contagious Foot-rot.—Contagious or true foot-rot of sheep is quite a different form of disease to the foot-sore already described. In this country, where the flocks enjoy freedom from such veritable plagues as foot-and-mouth disease and sheep-pox, true (contagious) foot-rot stands as one of the most serious diseases that exist among sheep generally, but it is a disease which is amenable to treatment, and can be prevented. If sheep-owners, therefore, appreciate the contagious nature of the disease and adopt effectual measures to prevent its introduction into a flock, or promptly combat it when introduced, they will be well repaid for their trouble.

Experiments have demonstrated the infective nature of the virus or poison of the disease by the application of the infected matter from diseased sheep to the feet of healthy sheep, and by the association of healthy sheep with diseased animals. The disease may affect sheep on dry or wet pastures if the infective agent be present.

It is admitted by those who are acquainted with the diseases affecting the feet of sheep that in some cases of foot-rot, especially in advanced cases, the diseased conditions may be so similar in appearance to foot-sore, that a differential diagnosis is very difficult; but by carefully considering all the circumstances, and by examining the fellow sheep, especially the more recent cases of disease, one will find that in foot-sore the trouble begins in the horn at the lower part of the foot.

Contagious foot-rot is primarily a disease affecting the soft structures of the foot. Any diseased condition of the horn itself is secondary, and is brought about by the separation of the soft from the horny structures through the agency of micro-organisms and the fluids exuded. The disease spreads from sheep to sheep, causing much lameness, loss of flesh, and even death from emaciation. If the disease appears in a flock of in-lamb ewes it is a still more serious matter, as proper treatment cannot be carried out without danger owing to the pregnant

condition of the ewes. In such instances the disease persists until the lambing season commences, and often spreads rapidly to the new-born lambs.

Apart from the adverse influence that wet seasons and damp low-lying pastures may have upon the horny structures of the feet, grit and dirt may work their way into the cleft of the foot and produce a wound. If the soil is contaminated with the virus that produces foot-rot, the disease will soon appear among the flock. It may, however, attack sheep with apparently firm horn and well trimmed feet.

Symptoms.—Lameness is usually the first symptom observed, and on examination of the affected foot a small, moist, unhealthy-looking, spot-like sore, will probably be found between the toes. The part is inflamed, hot and tender, and the animal shows signs of pain when it is manipulated. There is little or no appreciable swelling of the coronet at this stage. The disease rapidly extends under the horny box, and if a little pressure be brought to bear on the inside of the foot a slight dirty foetid discharge will be observed oozing from the edge of the horn around the ulcerated spot. The discharge is never very great, but is always foul smelling; in fact the foetid smell is often detected before any gross lesions have been discovered.

The disease progresses from above downwards, between the sensitive structures of the horn and the hoof. When the horn is pared away the diseased parts are found bathed in the foetid discharge, and the greater portion of the foot may be implicated. In some cases the disease extends from the primary seat of the disease to the more important tissues of the foot, injuring the ligaments, tendons, and even the bones.

In protracted or severe cases the foot may be greatly swollen, very tender, and hot. The upper part of the toe is widely separated and the points turn inward, giving the appearance of a club. The animal is in great pain when weight is placed on the affected limb. Abscesses form in the soft tissues of the foot and burst outwardly around the coronet, leaving angry discharging wounds. At the start one foot is usually affected, but frequently the disease appears in two, three, or may be all four feet. In the latter case the animals are unable to move about in search of food. They may be seen feeding on their knees, or lying down feeding on the grass around them.

In cases associated with much pain, and where three or four feet are affected, the animals refuse to feed, rapidly lose flesh; and may develop diarrhoea. Such animals become extremely weak. They present a dejected and emaciated appearance, and they may die. The various stages of the disease can be seen in one flock. Granulating tissue or proud flesh and new horn-like tissue may grow out from the wounded surfaces. In the early stages of the disease the hoof itself appears normal; but as the condition advances the horn becomes broken and decayed, and if the feet have not been attended to, the whole toe may be cast. During the hot weather the condition is aggravated, and deaths are more numerous from the fact that the foetid discharge attracts flies, and maggots subsequently develop in the wounds. The animal may become fly-blown on every part of the fleece which has come in contact with the discharges, and under such conditions it soon succumbs.

Prevention.—It has been said that a shepherd has no right to have foot-rot among his flock. Providing ordinary care is observed the disease should not at least get beyond control. Although the best means to prevent the introduction of the disease is to avoid bringing suspected sheep on to clean pastures, it is not one which can always be carried out. Attention must especially be directed to fresh arrivals. In the first place it is necessary to examine any sheep which may fall lame, and any sheep which are not lame but are noticed to show wounds or sores around the hoof or over-grown horn.

1. Periodic inspection, examination and trimming of overgrown feet is a practice to be recommended, and upon the slightest indication of disease affecting the skin between the toes, the affected sheep should be isolated and treated, and the remainder put through a bath containing one of the preparations given below as cures for foot-rot.

2. In the case of sheep bought in a market or taken to a market and brought back, or any fresh arrivals, they should whenever possible be isolated and the feet of each sheep examined. Isolation should be continued from three to four weeks, as disease might appear after an interval of two or three weeks, although the sheep appeared apparently free from disease at the time of arrival; or as a precautionary measure after examination the sheep should be put through one of the

specially constructed shallow baths, containing one of the preparations recommended below, on two or three occasions during the first week or ten days after arrival and before mixing with the other stock.

3. The shepherd should always wash and disinfect his hands after examination of the recently imported stock before attending to any of the old stock, and the same remarks apply after the examination of any individual suspected case.

4. It is advisable to afford contaminated pastures a rest from sheep until a winter's frost has intervened.

5. Attention must be given to the sheep fold and other pens, which should be thoroughly and effectually disinfected, and the manure and a few inches of the surface soil should be removed and ploughed into the land.

Remedy.—1. In the first place examination of the entire flock and separation of the healthy from the diseased animals should be carried out. The apparently healthy sheep should be daily, or every second day, put through a shallow bath or trough containing some suitable preparation, and the treatment may be advantageously continued for ten to fourteen days after the last case is detected.

2. It has been observed that a sheep may apparently recover without treatment from foot-rot, and the disease may break out again in the same sheep after an interval of several weeks. The second attack may be even worse than the first attack, but the animal may eventually recover without treatment, or it may die. Treatment, however, is necessary to avoid loss, and prompt measures will materially assist in arresting the spread of the disease to other members of the flock. The earlier the cases are recognised and treated, the more readily and certainly will they yield to treatment, and aggravated and advanced cases—usually the result of neglect—should rarely occur. Everything possible should be done to prevent the disease extending into the deeper structures, which cannot be effectually treated without permanent damage to the foot. After thorough cleansing of the affected foot, all detached horn should be freely but carefully removed, so as to expose the affected sensitive surfaces. A little skill and patience must be exercised in paring away the horn of the foot, and the operation should not be carried out in the somewhat rough and

careless manner that is adopted by some shepherds. It is imperative to expose all the diseased tissue, and the more advanced and neglected the case the greater will be the labour required. The exposed diseased parts should be thoroughly cleansed with suitable remedies by washing, or by standing the patient in a bath for several minutes. All granulations or fungoid growths should be removed with the knife or snipped off with scissors.

3. It is important to remember that all removed particles of horn or other tissue should be destroyed, buried or disinfected, as such infective material may serve as a means of further spreading the disease.

4. Whenever the cutting has been deep or the exposed surface is extensive, a piece of clean tow, previously saturated in some antiseptic solution, should be applied, and kept in position by a properly adjusted bandage.

5. Advanced and severe cases, implicating deep structures of the foot, will require more constant attention and repeated treatment, such as cutting away as much of the diseased tissue as possible at each inspection, cleansing and disinfecting, and finally covering the parts with antiseptic powder and bandaging to keep both soil and filth out. In the case of in-lamb ewes every care should be taken in handling the ewes, and when individual treatment is deferred until after lambing, all the flock should in the meanwhile be put through the shallow bath (mentioned below) in the ordinary way at frequent intervals.

It was noticed some years ago that the ordinary process of dipping sheep had a curative effect on foot-rot, and the good results were ascribed to the action of the poison on the cause of the disease. Arguing from this it appeared probable to the Board of Agriculture and Fisheries that beneficial results would follow the walking of affected sheep through a solution of poison just deep enough to cover the hoof, and in practice this was found to be the case.

In order to test the effects of such treatment on a considerable scale the Board, early in 1904, distributed thirty baths (16 ft. by 1 ft.), each accompanied by 1 cwt. of copper sulphate, amongst a corresponding number of sheep farmers in Great Britain. The instructions were to walk the sheep once a month

or oftener through a 5 per cent. solution of the copper sulphate (1 lb. in 2 gallons of water), after having cleaned and dressed the hoofs in the case of a bad attack.

Reports from most of the recipients were received, and they were quite unanimous in ascribing much benefit to the use of the bath. But it would appear, from the information to hand, that still better results (especially where it is a case of curing rather than preventing) will be got by using a 10 per cent. solution (1 lb. of copper sulphate to 1 gallon of water), and as stated above the sheep should be put through the bath at frequent intervals.

Although the Board have only experimented with copper sulphate, they are aware that other substances are used, e.g., 3 oz. arsenic, mixed with 3 oz. washing soda and boiled in 2 gallons of water; or 1 part of sulphuric acid to 10 parts of water. Arsenical and other sheep-scab dips may also be used, but it is doubtful whether any substance is more effective than copper sulphate, and the latter is comparatively safe and easy to manipulate.

Summary of directions for using the Foot-bath.—(a) Bath of wood or concrete, 16 ft. long and 8 in. wide (12 in. is unnecessarily wide), sides sloping out, ends 3 in. deep, provided with cross pieces or grooves to prevent slipping, side fences close boarded and to slope out so as to admit of sheep walking easily through. (b) Solution to consist of 1 lb. copper sulphate in 1 gallon of water or, if prevention only is aimed at, half this strength will suffice. Time to be allowed for thorough solution. (c) Copper sulphate to be bought under a guarantee of purity (98 per cent.), and if possible in the powdered state, not in large crystals. (d) Sheep if badly affected to have hoofs pared before being put through the bath. (e) A day when the grass and soil are dry to be selected. (f) Copper sulphate and most of the substances used being poisonous, a cover for the bath to prevent stock drinking the solution may be an advantage. In any case the bath must be well fenced in. (g) If ewes with lambs at foot are treated, they should be put through very quietly so as to prevent the solution getting on to the teats, and thus into the mouths of the lambs. (h) Sheep with long wool should also be put through very quietly, otherwise the solution may discolour the wool.

SHEEP-DIPPING BATHS.

Two convenient forms of sheep-dipping baths, which have come under the notice of the Board's Inspectors, are described below. The first is a movable wooden bath, the dripping pen for which forms a useful cart for taking animals to market. The second is a fixed bath made of cement, which can be put up at a moderate cost.

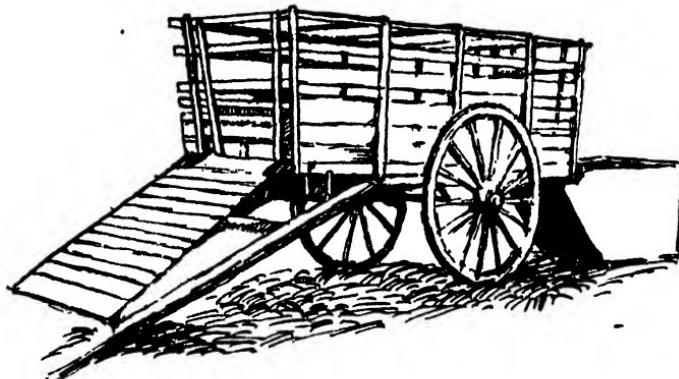


FIG. 1.—Cart dipper arranged ready for dipping.

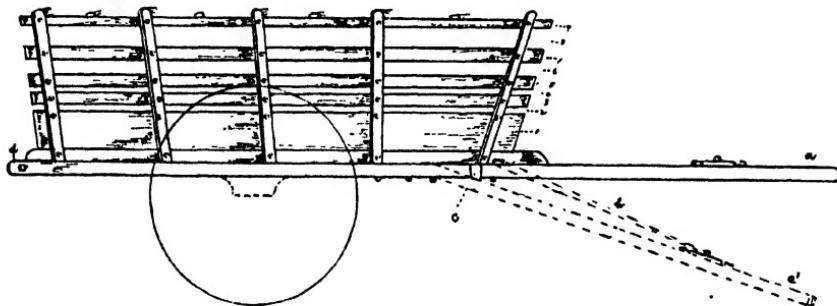


FIG. 2.—Vertical section through cart :—(a), shaft 6 ft. 2 in. to draw-bar; (a¹), shaft in position for dipping; (b), inclined board, hooked on and resting on shafts for sheep to walk down after draining; (c), wood block to retain cart in position after releasing top bar and lowering shafts; (d), end to attach to bath; sides of cart, lowest board (1), 10 in. × 1 in.; laths (3), (5) and (7), 3 in. × 1 in.; top bar, 2 in. × 2 in.; wheel, 3 ft. 11 in. diameter.

Portable Wooden Bath.—The arrangement of this bath is represented in Fig. 1. It consists of a wooden bath, attached to the tail end of a tip cart which can be fixed horizontally while the shafts are sloped to the ground to carry a board for the descent of the sheep. After being dipped the sheep pass from the bath up the slope into the cart, where they

remain a short time to drip, and then descend the wooden slope fixed over the shafts.

The sides of the cart (Fig. 2) are of 1 in. boarding bolted to uprights. The lowest board is 10 in. \times 1 in., the three laths above 3 in. \times 1 in., with a bar 2 in. \times 2 in. at the top. Spaces of 1 in., 2 in., 3 $\frac{1}{4}$ in., and 4 $\frac{3}{4}$ in. are respectively

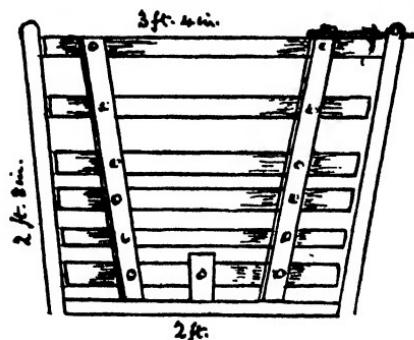


FIG. 3.—Ends for closing cart. These doors are fixed to the top-bars at each side, so that they can be thrown back across the top of the cart.

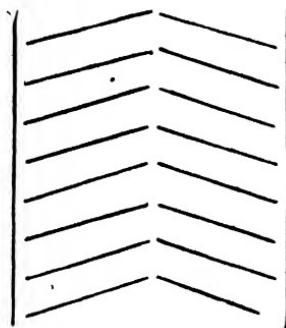


FIG. 4.—Method of nailing slips to bottom of cart to secure drainage.

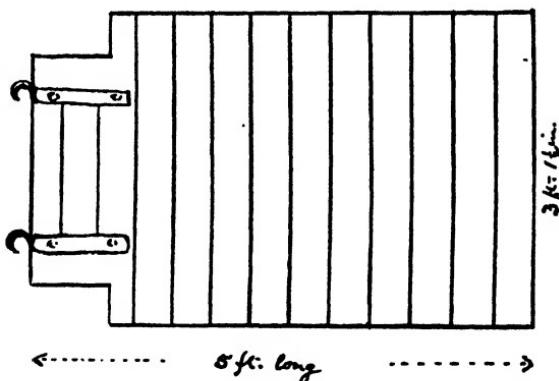


FIG. 5.—Board to hook on over shafts for sheep to walk down. This is made of 1-in. boards, with two battens 6 in. \times 2 in. underneath. The cross-slips are 1 in. \times $\frac{1}{2}$ in., about 4 in. apart.

allowed between the boards and laths. The bottom of the cart is strongly made and carries wooden slips nailed on 7 in. apart, so as to give a foothold for the sheep. In order to ensure free drainage the slips should be put on as shown in Fig. 4. The top is covered in by a number of cross rails 12 in. to 14 in. apart, and made of wood 2 in. \times 1 $\frac{1}{4}$ in. The

ends are closed by doors (Fig. 3), which fasten by wooden buttons at the bottom and may be thrown back on to the top of the cart when necessary. The shafts are 6 ft. 2 in. long to the draw bar, and the cart is 16 ft. 9 in. over all, and suited to a horse of 15 to 16·2 hands.

The descending slope (Fig. 5) is made of good 1 in. boards with two 6 in. \times 2 in. battens underneath, slips 1 in. \times $\frac{1}{2}$ in. being nailed on across the slope 4 in. apart. It is attached to the cart by means of hooks.

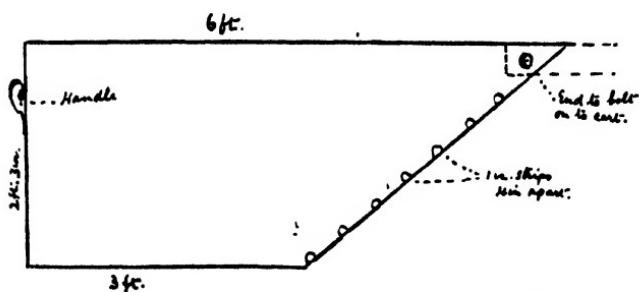


FIG. 6.—Bath, 6 ft. long, 2 ft. 6 in. wide, 2 ft. 3 in. deep. The top of the slope is bolted to the tail-end of the cart.

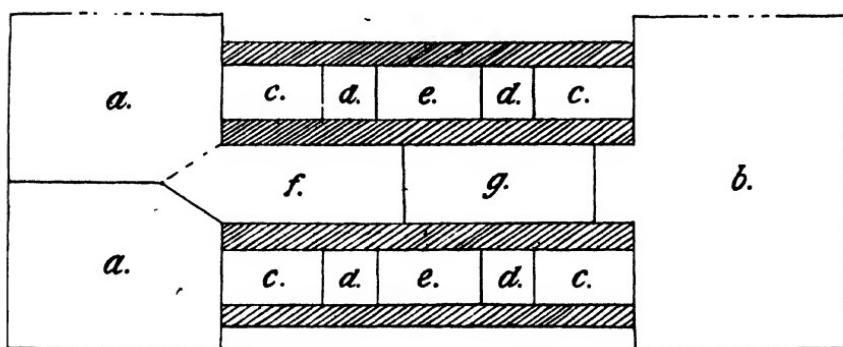


FIG. 7.—Plan of permanent cement swim-bath:—(a), draining pen, 9 ft. \times 4 ft. 3 in.; (b), collecting pen, 10 ft. \times 8 ft. 6 in.; (c), (d) and (e), ground level, step and manhole; (f), slope; (g), swim-bath.

The bath itself (Fig. 6) is of 1½ in. pine, with an inside slip round the top of the bath to prevent splashing. It is 6 ft. long, 2 ft. 6 in. wide, and 2 ft. 3 in. deep, the slope commencing 3 ft. from the deep end. Handles are fixed to the outside of the deep end, and 1 in. cross slips are nailed 4 in. apart on the slope to ensure foothold for the animals.

The cost of all woodwork and two coats of paint for the body

of the cart is stated in one case to have been £4 10s., while the iron work and fixing complete was about £1 15s. Wheels and axles would be extra, and are very variable in cost. The wheel in the figure is 3 ft. 11 in. in diameter.

A Cement Swim Bath.—A type of dipping bath which has been put in on a good many of the larger farms in the north of England

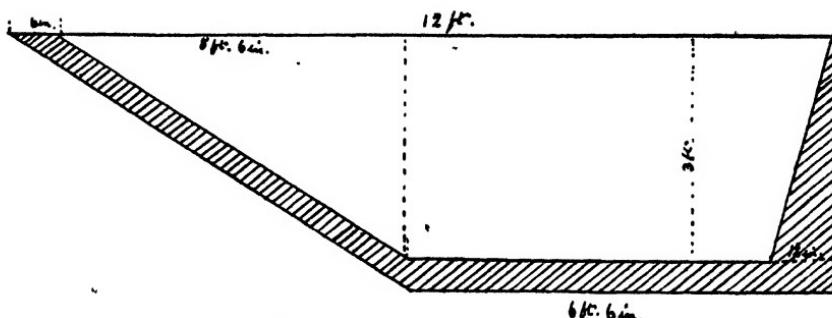


FIG. 8.—Longitudinal section of cement swim-bath, 12 ft. long, 3 ft. deep, 12 in. wide at bottom, 20 in. wide at top, slope commencing 6 ft. 6 in. from deep end.

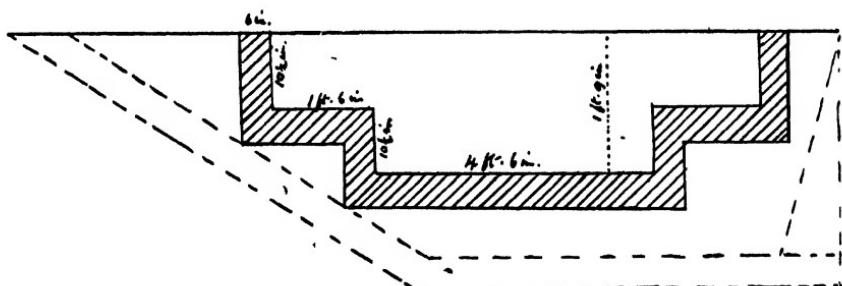


FIG. 9.—Longitudinal section through man-hole.

is a permanent cement swim bath 12 ft. in length, 3 ft. in depth, 12 in. wide at the bottom and 20 in. wide at the top, the sloping walk-out commencing 6 ft. 6 in. from the entrance or deep end. A plan of the bath is shown in Fig. 7. On either side of the bath is a manhole in which stands a man attending to the sheep in the bath. Each manhole is entered from the ground level by two 10½ in. steps, thus being 1 ft. 9 in. deep, as shown in Fig. 9. The cross section in Fig. 10 shows the bath with a manhole on each side, while Fig. 8 is a longitudinal section of the bath itself. The walls, &c., may be made of cement, for the moulding of which wooden templates and moulds are necessary. These moulds cost about £1 10s.

for material and labour, but may be used more than once if necessary. The outer walls of the manholes are 6 in. thick and the walls of the bath proper 8 in. thick, a steep slope at the deep end of the bath running out to 12 in. thick at the bottom (Fig. 8).

At the entrance end of the bath is a cemented collecting pen 10 ft. x 8 ft. 6 in., and at the exit end is a double draining pen, each half being 9 ft. x 4 ft. 3 in. A gate at the slope exit from the bath closes each pen for a time in turn.

No drainage is provided to the bath, as this would add considerably to the cost, and it is found a simple matter to bale out the bath after use. The bath will accommodate two lowland or three Fell sheep, or from four to five lambs at a time, and in a short day's dipping 500 to 600 sheep can be handled.

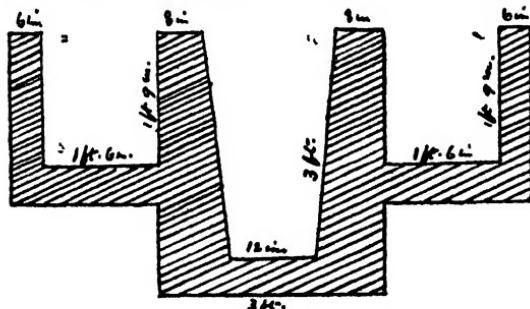


FIG. 10.—Cross-section through bath and manholes: bath in centre, and manhole on either side.

The cost for constructing such a cement dip on an estate in Lancashire has been given as:—

	£ s. d.
8 loads gravel, at 2s. 6d.	... ... ... ... 1 0 0
13 bags cement	... ... ... ... 2 10 0
Posts and rails for pens	... ... ... ... 1 10 0
Joiner's time	... ... ... ... 1 0 0
Labour	... ... ... ... 1 15 6
Cartage	... ... ... ... 0 10 0
Moulds, &c.	... ... ... ... 1 10 0
Total ..	<u>£9 15 6</u>

As an alternative stone or brick, faced with cement may be employed in place of solid cement. In such a case the thickness of the walls given above other than those actually forming the bath would seem to provide unnecessary strength, and no doubt 4 in. would suffice instead of 6 in.

CATERPILLARS.—A number of specimens showing infestation by caterpillars have lately been received. Caterpillars of winter moths were doing much damage

Notes on at St. Mary Cray (Kent), Earls Barton
Insect, Fungus and (Northampton), Oakham, Twickenham.
Other Pests.* Boston (Lincs.), &c. For an account
of winter moths see Leaflet No. 4.

The caterpillars of the lackey moth (Leaflet No. 69) and the ermine moth (Leaflet No. 65) were attacking fruit trees at Debenham (Suffolk), while the caterpillars of either the gooseberry sawfly (Leaflet No. 12) or the magpie moth (Leaflet No. 20) appear to have damaged gooseberry bushes at Bristol, Colchester, Ipswich, Weymouth and Sevenoaks.

BEETLES.—*Pigmy Mangold Beetle*. A beetle which is damaging the mangold crop at Gloucester, Mortimer, (Berks.), and Cullompton (Devon) is that known as the pigmy mangold beetle, *Atomaria linearis*. This species occasionally does great harm to this crop. The insects live in the soil and destroy the parts of the young plant below the surface of the ground. The beetles are also found above ground, but the life history of the pest is practically unknown, and this lack of knowledge makes it difficult satisfactorily to give recommendations for treatment.

In infested districts on the Continent thick seeding is practised. Where the crop is hopelessly destroyed deep ploughing should be resorted to. Treating infested plants with soot, and hoeing this well into the soil, might have a beneficial effect. In the case of a tiny beetle which is very destructive to seedling turnips and attacks the plants in the same way as *A. linearis* does the mangold, good results have been obtained by steeping the seed before sowing in turpentine or paraffin, the odour of which is apparently deterrent to the beetle. Mangold "seed" would be more difficult to treat than turnip seed, but a certain proportion of the seed might be treated before sowing and the result be compared with that of an untreated area. In an experiment with turnips, in which a drill 33 feet long was sown in each case, the following results were obtained :—

* Notes on insect, fungus and other pests, dealing with the specimens submitted to the Board for identification, and their apparent prevalence, will appear in this *Journal* month by month. The notes commenced with the issue for June, 1907.

		Number of Bulbs.		Weight. lb.
Seed steeped in turpentine ...	...	51	...	100
Seed untreated ...	..	43	...	85½
Seed steeped in paraffin ...	...	49	...	101
Seed untreated ...	..	45	...	90

Two harmless beetles.—A beetle forwarded for examination from East Ham was identified as *Silpha quadripunctata*, a member of the family *Silphidae*. This family consists chiefly of species which, both in the adult and larval form, are carnivorous insects. A number live on carrion. *Silpha opaca*, though carnivorous and a feeder on carrion, is in the larval stage also partly a vegetarian, and has proved harmful to beet and mangolds; probably in most cases it has reached the fields in manure. *S. quadripunctata* is in some parts of the country not uncommon at this time; it is credited with the destruction of caterpillars.

Another harmless beetle, *Nebria brevicollis*. was received from near Kidderminster. This is not an uncommon British insect, and is harmless to plants, for both in the adult beetle stage and as a grub it is carnivorous in diet and predaceous in habit. The grub is active, six-legged, dark brown in colour on the upper surface, and recognisable by a projection from the anal region and also by two hairy styles. It is found in damp, shady places.

Beetle on Strawberries.—From Grays specimens of beetles were forwarded, which were severely damaging strawberry plants. They were identified as *Rhynchites minutus*, a widely distributed species of a genus that is sometimes destructive. The beetles, according to their species, lay their eggs in leaves, on leaves, in fruits, or in twigs. Some of the leaf-infesting forms roll up the attacked leaf. *R. minutus* is found also on trees, and, according to Fowler, especially on young oaks. Its pupal stage is passed in the soil. Unfortunately nothing can be done to combat this insect when adult, except (where the beetles are in number) shaking them off the plants into a vessel containing some paraffin. The beetles may also be taken by sweeping the herbage with a fine net, made of muslin or similar material.

Beetles on Willows.—Specimens of willows from Ormskirk were found to be attacked by two very destructive beetles,

Phyllodecta (Phratora) vitellinae and *Galerucella*, while *Galerucella lineola* was also forwarded for identification from South Petherton (Somerset). In each case the beetles were severely damaging the infested beds. The eggs of the latter beetle soon hatch (they have been hatched indoors in a week), and as the grubs from the eggs join the beetles in feeding on the leaves the damage is likely to increase rapidly.

The two beetles may be dealt with in the same way. When the beetles are feeding a good plan is to send boys round the beds to brush or shake the pests on to tarred boards or into vessels containing paraffin. Thousands may be accounted for in this way and much egg-laying consequently prevented.

In a case where *G. lineola* did much damage two years ago, spraying experiments with Paris green and arsenate of lead were suggested, and a report was made in favour of Paris green. This should be bought in the paste form. As it does not dissolve in water, care should be taken to keep the mixture well stirred or the leaves will be scorched. The Paris green poisons the beetles, which devour it with the foliage. The owner of the willows also reported favourably on a paraffin-emulsion spray prepared by dissolving 1 lb. of soft soap in 1 gallon of boiling water, adding 1 pint of paraffin to this while still boiling hot and churning the mixture until an emulsified buttery mass results. Sufficient water should then be added to make 8 gallons and the whole stirred thoroughly. An acre was sprayed with this mixture with excellent results.

As a preventive measure the beetles should be destroyed if possible in their winter quarters.

Mustard Beetle.—Information was received from Bourne (Lincs.) that much damage was being done by the mustard beetle (*Phaedon betulae*), a short account of which was given in this *Journal* for July, 1907, p. 214.

FLIES.—Several specimens of flies and their larvae were received. From Framlingham were sent specimens of the so-called fever fly (*Dilophus febrihs*), a note on which will be found in this *Journal* for July, 1907, p. 219. *Sciara* flies or fungus gnats (*Journal*, June, 1907, p. 162) were received from the same source, and also specimens of St. Mark's fly (*Bibio Marci*) so-called because the adult issues about St. Mark's day. *B. Marci* was also sent from Totteridge (Herts),

while *Sciara* larvae were also received from Chiswick. For a brief account of *B. Marci* see the *Journal*, July, 1907, p. 218.

Specimens of cabbage from Waltham Cross were infested with the maggots of the cabbage root fly (*Phorbia brassicæ*), the small pieces sent containing no less than five puparia and nine maggots. (See Leaflet No. 122).

From Bourne (Lincs.) were received specimens of pears infested by the larvae of the pear midge (Leaflet No. 53), a pest which is stated to have gradually increased in the district during the past four years. It has done very great damage to all varieties of pears during the present spring.

VARIOUS SPECIMENS.—Many other specimens of insect and other pests were received. Aphides were severely attacking willows at Ormskirk. (See Leaflet No. 104, *Aphides or Plant Lice*), while American blight or woolly aphis (Leaflet No. 34) was infesting apple specimens from near Bristol. Brown Lecanium scale was found on plum trees from Halstead (see *Journal*, June, 1908, p. 195). Black currant mite (Leaflet No. 1) was sent from Bury St. Edmunds. The pear-leaf blister mite (*Phytoptus pyri*) from Wellington, Salop, was found to be causing minute blisters or warts on the leaves of pear. When a tree is badly attacked the leaves fall early, and the fruit is usually deformed, hard and gritty. Diseased leaves should be picked by hand and destroyed not later than July. (See also *Journal*, March, 1908, p. 743). Red spiders on gooseberries were received from Newchurch (Isle of Wight). Millipedes (Leaflet No. 94) were causing much damage to young peas, parsley, &c., at Llanymynech (Mont.), and mealy bug was found in a viney in Jersey.

Gall Mite on Lime.—Leaves of the lime, from Broadstairs, were infested with the gall mite (*Eriophyes tiliae*), which causes growths or galls. These "nail" galls, as they are termed, are hollow and lined with numerous hairs, among which the microscopic mites live. The details of the life history of the mite are not yet known. If the migrating period could be ascertained, dusting with lime and sulphur might be practised as in the case of the black currant gall mite.

Woodlice and Mites in Poultry House.—A correspondent in Kilmarnock has been much troubled with feather eating among his poultry. This complaint, caused by a mite described in

Leaflet No. 57, may be dealt with in the manner suggested in the leaflet. Dipping the fowls in a bath prepared from "staves-acre" should also be tried three times at intervals of a week. The woodwork, &c., of the fowl house should also receive attention, and perhaps no method will be more successful than pumping boiling water over it with a continuous pump from a cauldron of water kept at the boiling point. Where such a plan is not feasible spraying with a 2 per cent. solution of formalin should be tried.

Woodlice, or slaters, were also very plentiful at the same place. They may be reduced in number by trapping (*a*) by flower pots containing wet grass, moss, or horse dung, or (*b*) by slices of potato or other vegetable dusted with arsenic. These traps should be placed at night near where the pests occur, and be regularly visited and dealt with in the daytime.

Eelworms.—Diseased onions from Bridgewater were found to be attacked by the stem eelworm, as also were oats from Stansted, Essex, while mangolds from Brook (Isle of Wight) were attacked by the root eelworm. For an account of these pests see Leaflets 46 and 75 respectively.

The Apple *Psylla* appears to be very prevalent in Lincolnshire and the Isle of Ely this season, and as a result there will probably be a reduction in the amount of fruit.

Cricket on Vines.—From Blackburn the Board received an insect taken on a vine. This insect proved to be the common cricket, *Gryllus domesticus*. It affects warm places, hiding during the day and coming out to feed at night. The common food is bread and bread crumbs, and moist vegetable matter, but it has also been known to be destructive to clothing. As no previous case was known of harm done by the cricket to vines, the correspondent was asked whether after further observation he was absolutely satisfied that the damage complained of was due to crickets, and not to vine weevils. In reply, the Board were informed that a cricket was observed on a leaf by lamplight, the position of the leaf was noted, and the cricket left undisturbed; in the morning the leaf was found to be eaten in several places. Crickets were also observed on buds and it was found that the buds were eaten just when they opened. After the leaves became older and tougher they did not appear to be touched.

The crickets might be destroyed (1) by choking up their hiding places—cracks, crevices, and holes, &c. ; (2) by injecting boiling water into the shelter places ; (3) by poisoning some ground-up carrots and potatoes and leaving them at night where the insects are troublesome ; (4) by taking advantage of their fondness for liquids and placing here and there basins containing sweetened liquids as traps.

FUNGI, &c.—Cabbage leaves injured by the parasitic fungus *Sphaerella brassicaecola* were received from Brook (Isle of Wight). It is important with this disease that all injured leaves should be removed and burned, as not only will the disease be prevented from further injuring the crop under consideration, but by so doing the soil will not be infected, as it would be if the diseased leaves were allowed to rot on the ground.

Diseased asters from South Molton (Devon) were found to bear fungus mycelium, but there was no definite proof that it was the primary cause of injury. The disease was a kind of " damping-off " caused by crowding and superabundant moisture during the seedling stage of growth. Such conditions favour the attack of various destructive fungi which could not exist under more normal conditions of culture.

Apple tree canker (Leaflet No. 56) was found on apple branches from Sandy ; pear scab (Leaflet No. 131) on specimens from Barnstaple and from Wellington (Salop), the early condition being indicated by the dark blotches on the leaves and young fruits ; and apple tree mildew (Leaflet No. 204) on specimens from Chiswick, Twickenham and Bristol. Brown rot of fruit (Leaflet No. 86) was found on apple specimens from Hailsham, St. Neots and Bere Alston (Devon) ; this disease is, under ordinary conditions, mostly confined to the foliage and fruit, but the badly ripened wood produced during the last few years, owing to a continuance of growth late in the season, has enabled the fungus to attack the shoots, all diseased portions of which should be removed and burned. Plum tree leaves were received affected with silver leaf, neither cause nor cure for which is known, although it is believed that a dressing of lime or common salt pricked into the soil is useful, the salt being applied at intervals of three months. Gooseberry specimens from Liverpool were attacked by the Cluster*

cup disease (Leaflet No. 209); gooseberry bushes from St. Ives (Hunts) were affected with white root-rot (Leaflet No. 64); potatoes from Bala with stem-rot (*Bacillus phytophthorus*), described in Leaflet No. 117; tulip bulbs and leaves from Penryn (Cornwall) and East Grinstead with the tulip mould, *Sclerotinia parasitica*, Massee, (Leaflet No. 127 deals with Sclerotium disease); and onions from Somersham (Hunts) with Sclerotium disease.

Spraying with a solution of sulphate of iron is a means of destroying dodder on clover, which has proved successful in Germany. Dr. Hiltner, Director of the

Eradication of Dodder. Munich Agricultural Botanical Institute, reports (*Prak. Blätter für Pflanzenbau*, April, 1908) that in 1906 a plot was sown

with red clover seed containing 2,000 seeds of dodder (*Cuscuta arvensis*, an American species) in 100 grammes (3½ oz.). The dodder developed luxuriantly and infested the whole crop. In August it was sprayed with an 18 per cent. solution of sulphate of iron, with the result that the clover had so black an appearance that one might have thought it was ruined. After a short while, however, it sprouted again, and grew at least as well as the portion which was left unsprayed. The latter was ultimately still more checked in its growth by the spreading dodder. The dodder entirely disappeared from the sprayed plot, though it afterwards made its appearance to a small extent in consequence of fresh infection from the adjacent plot.

In a similar experiment in 1905 the solution was applied in two strengths, 15 and 18 per cent. In this case, however, the clover did not recover after the application of the stronger solution, and although experience in the destruction of charlock shows that clover is generally able to withstand spraying with iron sulphate, Dr. Hiltner thinks it unnecessary to exceed a strength of 15 per cent. The same treatment is applicable to the destruction of the common clover dodder (*Cuscuta Trifolii*). The spraying must be done with a sprayer, so that the liquid falls with some force on the ground, and reaches the threads of dodder which are attached to the stalks of the clover beneath the surface. An application with a watering-can did not prove successful.

According to an account in the *Agricultural Journal of the Cape of Good Hope*, February, 1908, the use of arsenite of soda has been found satisfactory for the destruction of dodder in lucerne in the Cape Colony. The solution recommended is $\frac{1}{2}$ lb. arsenite of soda to 5 gallons of water. It is stated that there is no fear of killing the lucerne, and if sprayed properly one application will suffice.

The Small Holdings and Allotments Act of last session authorises local authorities, with the consent of the Board, to let small holdings and allotments to any association formed for the purposes of creating or promoting the creation of small holdings or allotments, and so constituted that the division of profits amongst the members of the association is prohibited or restricted (see sections 9 and 21 (3) of the Act).

With the view of facilitating the formation of such associations, and of enabling existing societies to alter their rules in order to bring them within the requirements of the Act, the Board have, in consultation with the Registrar of Friendly Societies, drawn up the following rules which must be adopted by any association or society desiring to hire land from a local authority under the Act :—

Small Holdings and Allotments.

- (1) The objects of the Society shall include the business of creating, or promoting the creation of, small holdings or allotments, and encouraging their proper cultivation, with power to acquire land from local authorities acting under the provisions of any Act for the time being in force relating to small holdings or allotments, or from any other person or body, to adapt any land so acquired for small holdings or allotments by the erection of dwelling-houses or other buildings or the execution of any other improvement, and to let the land to members of the Society to be cultivated by them as small holdings or allotments.

Small Holdings and Allotments Accounts.

(2) Separate accounts shall be kept by the Society of all receipts and expenditure of the Society under the Rule headed "Small Holdings and Allotments." The receipts shall be applicable for the following purposes and no other purpose whether during the existence of the Society or on dissolution :—

- (i) For payment of the expenses of managing land acquired under the said rule, including payment of rent, rates, taxes and other like outgoings ;
- (ii) For payment of expenses of repairs or improvements from time to time made by the Society on such land ;
- (iii) For payment to the general account of the Society of interest at the rate of £5 per cent. per annum on all capital expenditure by the Society on the acquisition or adaptation of such land ;
- (iv) For recouping capital expenditure by the Society on improvement or adaptation of the land within such period as is reasonable having regard to the probable duration of the improvement or work of adaptation ;
- (v) For forming a reserve fund not exceeding [one] year's annual value of the land, and so that such reserve fund shall be available for any purpose authorised by this Rule but for no other purpose ;
- (vi) For prizes for the encouragement of the proper cultivation of the land ; and
- (vii) For creating or promoting the creation of small holdings or allotments generally.

Nothing in this Rule shall prejudice or affect any right or remedy of any creditor of the Society.

The advantages of letting land to an association need very little emphasising. The local authority will receive its rent in a lump sum from the association and will be relieved of a good deal of the responsibility in connection with the management of the land. The association will select its own tenants, supervise the cultivation of the land and collect the rents from its individual members. It will be to the interest of every member to see that the tenants are carefully chosen and that the land is well farmed.

By adopting the foregoing rules existing societies can

become land renting societies under local authorities, and so widen considerably their sphere of usefulness. Accordingly the Board have been in correspondence with the Agricultural Organisation Society and the Co-operative Union in the belief that the far-reaching organisation of these bodies forms the best channel by which practical effect may be given to the special provisions of the Act to which reference has been made.

The Agricultural Organisation Society of Dacre House, Dacre Street, Westminster, S.W., has hitherto done useful work in promoting the formation of local agricultural trading societies on co-operative lines, and under its auspices such societies have been established in various parts of the country for the purpose of enabling farmers to purchase their requirements and to sell their produce by organised co-operative methods. By arrangement with the society the two special rules drawn up by the Board have been incorporated in the Model Rules which the Society issues for the guidance of those desiring to form a local society of the nature indicated. A society formed on the basis of these rules will therefore not only qualify as the tenant of land under a local authority, but will at the same time be in a position to offer its members the advantages to be obtained from co-operative methods of business.

In the case of the Co-operative Union and industrial co-operative societies generally still greater benefits may be expected to result from the use of the powers given by the Act. These societies already possess the machinery to enable them to handle large quantities of agricultural and market-garden produce, and flourishing as they do chiefly in the large centres of industrial population they can provide a ready market for such produce.

The fact that some of the industrial societies have acquired by their own efforts, and already manage successfully, considerable areas of land is a good augury for the successful development of the agricultural side of the co-operative movement. It is therefore a matter of satisfaction that the negotiations between the Board and the Co-operative Union have resulted in an active movement on the part of the latter body to encourage industrial co-operative societies to avail themselves of the opportunities given by the Act.

The area under wheat in Egypt in 1906 was 1,219,082 acres, of which 586,249 acres were in Upper Egypt. The production per acre is considered by expert local agriculturists to lie between $21\frac{1}{2}$ and $24\frac{1}{2}$ bushels. The exports are unimportant, and the imports come chiefly from

Wheat Growing in Egypt. France, Russia, and England, but it is stated in *The Year Book of the Khedivial Agricultural Society*, 1906, that an attempt is now being made, on a small scale, to improve the crop by the introduction of "strong" wheats fit for export to Europe. High yield seems to be the primary local necessity, while next to this is the need for a heavy straw crop. Immunity from rust is also essential. Many wheats exist elsewhere which fulfil all these requirements, but there is one other requisite far more difficult to allow for—suitability to the Egyptian climate. Many attempts have been made in the past to bring in better wheats, but only "Indian" and Algerian wheats have succeeded. Experiments are now being made on the lines of those instituted by Mr. R. H. Biffen at Cambridge to breed a wheat suitable to Egyptian conditions. Samples of new wheats bred from Russian or American spring wheat have given very heavy yields in Egypt, but were too late in maturing and also too short in the straw. It is proposed to cross these heavy-yielding varieties with strains of Indian wheat possessing the qualities of long straw and early maturity.

In Egypt, a good crop of Indian wheat compares favourably in value with a moderate cotton crop; the trouble of cultivation and the risk of loss from insect pests are far less for wheat than for cotton, and the two can be grown on a three-year rotation without prejudice to either. Although Egypt is at present importing wheat for her own consumption, the Nile Valley would seem to possess great capabilities as a wheat-producing centre.

The manuring of old land hay has been carried on experimentally under the direction of the Agricultural Department of Armstrong College, Newcastle-on-Tyne, **Manuring of Old Land Hay and Pasture.** at 6 centres in Cumberland for 13 years, at 3 centres in county Durham for 6 years, at Broomhaugh, Northumberland, for 13

years, and at Cockle Park for 11 years. Professor Gilchrist, in reporting and commenting on the results obtained (*Bulletin No. 7*) observes that they indicate—

- (a) That on heavy soils, phosphatic manures only are as a rule most profitable for old land hay.
- (b) That on the lighter classes of soils, a potash manure should be added to the phosphatic manure.
- (c) That in the long run nitrogenous manures, either alone or in combination with other artificial manures, are not likely to be profitable for old land hay.
- (d) That on heavy soils, phosphatic manures will develop clover plants and leguminous herbage, and that the same manures with a potash manure will develop the same plants on the lighter classes of soils. These plants collect nitrogen in large quantities from the air, by means of their root nodules, which is likely to be much more valuable than nitrogen in the form of nitrate of soda or sulphate of ammonia applied to old land hay.
- (e) That basic slag is likely to be the most effective phosphatic manure, especially on heavy soils, although bone meal may give excellent results, but this manure is slower in its action than basic slag. Neither superphosphate nor dissolved bones have given anything like so satisfactory results as the two foregoing phosphatic manures. The great bulk of the soils in the north of England are poor in lime, and this perhaps explains the poorer results from the latter manures.

The experience obtained from these various experiments, which have extended in all over fifteen years, enables the following suggestions to be made for the manuring of old land hay and of pasture :—

- (1) On soils in poor condition a dressing (per acre) of 10 cwt.s. high class slag, with, on the lighter soils, the addition of 2 cwt.s. muriate of potash (or about 6 cwt.s. kainit) is likely to be very generally useful. If dung has been used on the lighter soils, however, the potash manure can probably be omitted. For the after treatment of these soils and for the general treatment of soils in better condition, the application of about 5 cwt.s. per acre basic slag of best quality every three years, with the addition of 1 cwt. muriate of potash on light soils, is likely to give good results.

If dung is available, 10 tons dung and 10 cwt. slag is a good first dressing per acre for poor soils, and this may be followed with the same dressing of dung every third or fourth year and a dressing of 5 cwt. basic slag of good quality every three years.

For soils rich in lime, superphosphate may be preferable to basic slag.

(2) Basic slag and the potash manures will give the best effects if applied early in the winter. The distribution of all the manures must be perfect and they should be well harrowed in, especially if the herbage is at all coarse and benty. It is advisable that when the turf of an old land hay field becomes matted it should be grazed for one or more years with cattle, as this class of stock is most effective in treading down turf; such land is also greatly improved by harrowing in spring with heavy harrows. It is desirable also that the aftermath of old land hay should be grazed and not mown, as the former does much to keep the turf in fine condition.

(3) On the whole, neither ground lime nor common lime have given anything like profitable returns, even several years after their application; in fact, these experiments indicate that basic slag is really the best source of lime for this purpose, and that it owes its good effects to the lime as well as to the phosphates that it contains. Half a ton of basic slag contains as much lime—partly free and partly in combination—as is contained in $\frac{1}{4}$ ton of ground lime. The fineness of grinding of the slag undoubtedly increases the effectiveness of the lime as well as of the phosphates it contains. It is, therefore, suggested that for most soils, the use of basic slag makes the application of either common lime or ground lime unnecessary for old land hay or for pasture. It is only soils of a peaty character, or those with a good deal of rough, matty herbage, or some organic matter, that are likely to give a return from these forms of lime. Slag generally supplies the lime requirements of all except this class of soils with more profitable results. The results of some experiments elsewhere have indicated that lime added to slag diminishes the good effects of this latter manure.

During the past autumn some diseased potatoes were submitted to Kew for investigation. The potatoes were well grown and externally showed no trace of **Hollow Potatoes.*** injury or disease, but when cut open were found to be hollow, an external shell, varying from a quarter to half an inch in thickness, remaining intact.

In some examples the cavity was quite empty, dry, and lined with a shrivelled mass, suggesting the previous presence of some semifluid substance that had contracted and dried up. In other cases the cavity was more or less filled with a glairy, unpleasant smelling pulp, which on microscopic examination was found to be teeming with nematodes or eelworms.

A series of sections revealed the fact that the nematodes effected an entrance into the tuber through the original point of attachment to its branch. Having once gained an entrance the nematodes gradually used up the substance of the tuber, working from the centre outwards until their progress was checked by the vascular zone which lies at some distance within the periphery.

This zone appeared in every instance to have acted as a perfect barrier to the further extension of the eelworms, hence the tissue lying between the vascular ring and the periphery of the tuber remained uninjured.

The nematode appeared to be *Aphelenchus pyri*, Bastian, a species originally found in decaying pears. Its presence in potato tubers, notwithstanding the amount of injury effected, does not necessarily prove the nematode to be a true parasite; it is at most a wound-parasite, gaining an entrance into the tuber through the minute opening formed by the decay of the tissue enclosed by the vascular ring at the point of its entrance into the tuber.

Two tubers infected at the point indicated above, by covering the scar with slime containing eelworms obtained from a diseased tuber, were placed under a bell-jar, and kept in the dark at an average temperature of 65° F. After ten days one of the tubers was cut open and revealed a cavity about one inch in diameter filled with slime containing myriads of eelworms. The second tuber was allowed to remain for a

month, when the internal cavity was found to have reached the limit of its extension, that is, up to the vascular ring.

In a second experiment the "eyes" of two tubers were covered with nematode-bearing slime, and afterwards placed under conditions similar to those described in the previous experiment. After remaining for a month the nematodes had not effected an entry into the tuber, although in some instances small "sprouts" had pushed from the eyes through the slime. This experiment may be taken to prove that the nematodes cannot effect an entry through an unwounded surface, even when the tissue is quite young. No trace of bacteria or fungi was found in the slime.

The potatoes were purchased at the Brentford market, hence their source of origin is unknown, as is also the nature of the soil in which they were grown, or the kind of manure used, &c. Judging from the large percentage of hollow tubers present in the small quantity purchased, it would appear that a local epidemic, caused by nematodes, had existed where the potatoes were grown.

The above account is not intended to convey the impression that all hollow potatoes are due to eelworms. Potatoes are often more or less completely hollowed out by centipedes, more especially by *Julus pulchellus*. In such instances, however, an entrance is effected by commencing at the surface and eating their way into the interior of the tuber.

Since the year 1902 no outbreak of foot-and-mouth disease or of rabies has been confirmed in Great Britain; as regards the former disease, however, this favourable

Report on Diseases of Animals. record has been broken since the commencement of the current year.

Of the other diseases scheduled for administrative action under the Diseases of Animals Acts, outbreaks of anthrax, glanders (including farcy), sheep-scab and swine-fever, have been confirmed in Great Britain in each of the intervening years. As regards the year 1907, glanders is the only disease in which a decrease in the number of outbreaks is shown in the returns as compared with those of the previous year. The position, as regards the various diseases,

is set out in detail in the report of the Board of Agriculture and Fisheries (Cd. 4129. Price, 1s.), in which the operations under the Diseases of Animals Acts during the year 1907 are discussed. It is stated that the increases in the number of outbreaks of sheep-scab and of anthrax do not give cause for any special anxiety, but that the greater prevalence of swine-fever is a matter for considerable concern, although there is no reason to believe that the favourable position which was attained in 1905 may not be recovered.

This publication includes a report by the Chief Veterinary Officer, Mr. Stewart Stockman, on the experiments and investigations which have been conducted in connection with the various diseases, and also a report by the Assistant Secretary in charge of the Animals Division, Mr. A. W. Anstruther, C.B., dealing with the administrative work undertaken during the year. It contains two coloured maps showing the relative prevalence of sheep-scab and swine-fever during the past three years and also a number of statistical tables.

In a despatch to the Foreign Office, the British Minister at Bogota (Mr F. W. Strange) states that the cattle business in

Colombia is a very lucrative industry.

Live Stock in Colombia, South America. Some high-class bulls have been imported and have thriven well on the Sabana, and

fine stock may now be seen there. It is said, however, that Shorthorn blood soon degenerates, and that the Devon strain is more constant, although maturing less rapidly and therefore in some respects inferior. Polled Angus have also been imported, but only by a few breeders. There is a small export of cattle to the West India Islands and Panama.

Sheep do well on the uplands, but the quality is not of the best. Pigs are very abundant and some of them, at least, are well shaped.

Mr. William Gordon, Vice-Consul at Medellin, reports that live stock has occasionally been imported into that district both from the United Kingdom and France, and has no doubt tended to develop the relatively fine quality cattle which can be seen at the weekly fairs. In cows there is apparently ample room for improvement in milk-producing qualities.

The International Live Stock Exhibition which is held annually at Chicago is the largest live stock show in the United States. The number of exhibits

Chicago Live Stock Show. in 1907 exceeded by 28 per cent. the record of the previous year, and included

1,263 cattle, 665 horses, 375 pigs and 1,146 sheep. Seventeen States were represented, and the international character of the exhibition was maintained by entries from Canada, England, Scotland and Germany.

An interesting feature of this exhibition is the prominent part taken in it by the agricultural colleges and experiment stations. The list of judges included thirteen members of their staffs and the exhibits of eleven institutions were distributed through nearly every class of entry. The Colleges took a considerable number of prizes, including several championships for fat-stock, one or other of them coming to the fore in almost every section. There were also special classes for the College exhibits. Of the Rosenbaum prizes for the greatest aggregate prize winnings of exhibitors from the different States, the first prize of £100 was given to Illinois University, the second of £60 to Iowa College, and the third of £20 to Wisconsin. Their success in open competition with the best breeders has had a great influence in popularizing agricultural education, and is stated to have produced a striking change in the attitude of the American farmer towards these institutions, while the inclusion of men connected with the Colleges in the list of judges has helped to secure the farmers' respect and confidence.

There was a large attendance of students, and the educational value of the show from their point of view is regarded as considerable. Prizes are given for the judging of live stock by students, and ten Colleges were represented in these contests. Iowa secured permanent possession of a valuable horse-judging trophy, while that for judging cattle, sheep and swine was awarded to Ontario. The trophy for judging maize, valued at £300, was permanently awarded to Iowa College, which had won it for three successive years. Twenty scholarships, depending on these contests and the prize winnings of the Colleges, were granted.

In view of the bad condition in which poultry is frequently imported into Argentina, and the possibility of birds intended for breeding purposes introducing diseases Regulations as to the which do not now exist, a law dated Importation of Poultry 7th February, 1908, has been passed into Argentina. which provides that :—

The Live Stock Department shall inspect all birds which are imported into the country, detain those which are suspected of being the vehicle of any disease and destroy those which offer any risk of spreading any contagious disease or which may be unfit for human consumption.

Those birds arriving dead are to be destroyed and those which come in the same cage or which have come from the same place shall be considered as suspected until the cause of the death of the former shall have been ascertained.

From 1st March, 1908, birds will not be allowed to enter the country without a sanitary certificate from the Live Stock Department.

As a means of affording some measure of control over the horse-breeding industry, the Department of Agriculture of Victoria adopted in 1907 a system of Registration of issuing Government certificates of soundness for stallions which on inspection and examination by one of the Government Veterinary officers are found free from hereditary unsoundness and defective conformation. The certificates are given for all breeds—draught horses, light horses and ponies—and it is provided that blemishes, unsoundness or defects of conformation which are the result of accident, external injury, overstrain or overwork will not disqualify.

During the year 1898 stallions were examined, and this number represents between 70 and 80 per cent. of the stallions standing for public use in the State. The Chief Veterinary Officer of Victoria, in reporting on the subject (*Journal of Agriculture*, December, 1907), observes that it is significant of the appreciation with which the scheme is regarded by the horse-breeders of the State that so large a percentage of horses should have been voluntarily submitted for examination during the first season.

The following ten conditions are regarded as evidence of

hereditary unsoundness, the existence of which in any degree would warrant refusal of a Government certificate: Broken wind, roaring, cataract, nasal disease (*osteo-porosis*), ring bone, side bone, bone-spavin, bog-spavin, curb, thoroughpin and bursal enlargements. Of all the horses examined 15·17 were refused certificates on the ground of hereditary unsoundness solely, but it is observed that in deciding as to rejections the examining officers have been the opposite of drastic. Of the 889 stallions examined, 684 received certificates; the percentage of refusals being thus 23 per cent. Seventy were refused as being defective in conformation, nondescript in type or below a reasonable standard for Government approval.

The question of the milk supply of towns is a subject which is attracting a good deal of attention in the United States,

and in a bulletin published by the
A System of Dairy Illinois Agricultural Experiment Station
Inspection in the (No. 120, *Milk Supply of Chicago and*
United States. *26 other Cities*) a suggestion is made for

the application of the method known as the "score card" as a guide to dairy inspection. The "score card," which has been applied in principle to judging of all kinds in the United States, is an arrangement by which the various points to be judged are each allotted marks according to their quality, the maximum to be awarded to any one point being printed on the card. The numbers are arranged according to the relative importance of the points, and the maximum total is usually 100. The system is chiefly advocated from an educational point of view as a means of enabling the student or the practical farmer to appreciate the points in which excellence is required.

In the particular card in question, which has been prepared by Professor Trueman for use in the inspection of dairy farms, the object also seems largely educational, as it is apparently intended that a copy of the card, showing the marks awarded should be given to the farmer after any inspection for his future guidance. It would also serve as an exact record for the inspector and as a means of comparison.

The points to be judged are arranged in five main divisions, each of which receives a maximum of 20 marks, as follows:—

1. *Health and Protection of the Herd* (no score is given until all sick cows have been removed; all cows coughing or emaciated must be isolated and their milk must not be used). (a) Cows in good vigorous condition, not too thin, 2; ventilation in stable, 6; light, 4; pure food and water, 4; comfortable cow-shed, 4.

2. *Cleanliness of Cows and their Surroundings*.—Cows all clean, 8; byre clean, 6; air pure, no insanitary buildings or manure heap within 200 ft., 3; yard clean and well drained, 3.

3. *Utensils*.—Utensils clean, free from rust, sterilised, 8; pure water for cleaning and protection of its source from contamination, 6; utensils constructed with seams filled with solder, so as to be easily cleaned, 2; proper place for cleaning and storing utensils, including steam boiler and sterilising oven, 4.

4. *Milkers and Milking* (all attendants must be healthy, and must not live in a house where any communicable disease exists).—Milking done with clean dry hands, and cows' udder sponged or wiped with damp cloth before milking, 10; special suits used for milking or regular suits well brushed, 5; use of small-top milk pail, 5.

5. *Handling the Milk*.—Prompt cooling to below 55° F., and keeping at a low temperature, 10; dealing with milk in a sanitary room, 5; protection during transportation, 5.

Directions for scoring, that is suggestions as to the method of allotting the marks, are printed on the back of the card.

A committee of the National Dairy Association is at present engaged in considering what would be the most acceptable form of score-card. The bulletin above mentioned gives another card differently arranged for use in the inspection of milk shops. This is in actual use in the City of Cleveland.

The Board have received through the Foreign Office a report by Sir William Ward on the steps taken for the protection of birds in Germany. It appears that the gradual disappearance in Germany of birds of all descriptions, but particularly of those kinds which are regarded as specially useful to agriculture led, about two years

Protection of Birds in Germany.

ago, to the establishment at Hamburg of a State institution for protecting and preserving birds in the adjacent rural districts. The institution was organised and is directed by the professors of botany attached to the Hamburg Botanical Gardens, whilst its practical management, that is to say the carrying out of the various measures destined for protecting the birds, is placed in the hands of an inspector or so-called "birdsman" (*vogelwart*).

The "birdsman" has been specially trained for his work by a German landowner (Herr von Berlepsch), who has long made the care of birds his special study. Herr von Berlepsch has laid down rules for the proper construction of nest boxes and for hanging them up in suitable places, as also for planting bird thickets—the two chief methods recommended by him for the protection as well as the propagation of birds.

Several extensive parks and gardens near Hamburg (Friedrichberg, Farmsen, &c.) have now been supplied with boxes, as well as most country places within Hamburg territory; the birds for which they are intended being tomtits, starlings, and woodpeckers.

During the year 1907 the Hamburg rural authorities have distributed 1,200 nest boxes free of charge, whilst 300 have been sold, and altogether about 4,000 nest boxes are said to be in use in the neighbourhood of Hamburg.

One method for the protection of birds is the planting of thickets for shelter, and the local authorities are about to establish in one of the country districts a large thicket measuring about 2,000 square yards. This thicket is to consist chiefly of blackthorn bushes at a distance of about $2\frac{1}{2}$ feet from each other. After every twelfth bush, beech, ash, and fir trees are planted; there will be smaller groups of wild currants and gooseberries, and around the whole there is to be a protective fence of wild rose bushes. It is stated that in the course of a very short time an animated bird life develops within these thickets.

The Prussian Government have issued several pamphlets describing these nest boxes and thickets with a view to encouraging the preservation of useful birds.

For some years past a campaign against rats has been conducted in Denmark. A committee was formed for this purpose in 1898, and in 1899 an attempt

Destruction of Rats in Denmark. was made to encourage the destruction of rats in Copenhagen by the payment of a premium of about $1\frac{1}{2}d.$ per head.

A sum of £550 was raised, and the permission of the Municipality was obtained to use the fire stations as receiving depôts. A sum of about 2s. a day was paid to a fireman at each station for acting as receiver. The experiment lasted from the 3rd August to the 9th December, 1899, during which time 104,000 rats were killed at a total cost of less than £750. Consequent on this example, similar attempts were made in several provincial towns and on several estates. In the latter cases the premium was reduced by about one-half on the ground that in country places the interest of everyone in the destruction of rats is so great that a much smaller sum is necessary to stimulate active efforts in that direction. In towns it was found that large numbers were brought in by children and by men who were out-of-work, many of whom took to this occupation as a means of livelihood.

The success obtained by these voluntary efforts led to a demand for legislation, and in March, 1907, a law was passed enabling rural and urban communes to undertake measures for the destruction of rats in their districts, and to provide for the payment out of the rates of a premium of from $\frac{1}{2}d.$ to $1\frac{1}{2}d.$ per rat. A sum of £1,650 is to be paid out of the public funds annually for three years, of which one-third will be devoted to scientific experiments and the remainder to the purchase of poisons and destructive agents for use on the State properties or otherwise.

The weather during the first week of June underwent great and sudden changes from very fine to thundery. Thunderstorms occurred in almost all parts of the

Kingdom, and were frequent and severe in the eastern half of England and in the north-west Midlands. The temperature was much above the normal over England until nearly the end of the week, then it fell very suddenly. Rainfall was "heavy" in England S.E. and N.W. and the Midlands, chiefly owing to storms of rain

and hail. On the 4th June measurements of over an inch were recorded at Tunbridge Wells, Eastbourne and Epsom, while at Dover as much as 1'14 in. fell between 5.30 and 6.0 a.m. Bright sunshine was above the average in the east and below it in

**Notes on the
Weather and the
Crops in June.**

the west. During the *second* week the weather was less fine, and in some places rain was frequent. Warmth was slightly below the average in the eastern section, markedly so in the west. Rainfall was "light" in England N.E., E., S.W. and the Midlands, "very light" in England S.E., while in Scotland E. and England N.W. it was "heavy," and Scotland W. it was "very heavy." Except in England S.E., where it was "moderate," sunshine was "scanty" (Scotland W. and England N.W. "very scanty") everywhere. In the first half of the *third* week the weather continued changeable, and on Tuesday and Wednesday heavy falls of rain occurred in many parts of England and Wales. On Thursday, however, fair weather set in and continued brilliant for many days. Warmth, therefore, appears for the week as "moderate" in England E., "deficient" in England N.E., S.E. and the Midlands, "very deficient" everywhere else. Rainfall was about normal, and sunshine slightly above the average. During the *fourth* week the weather was very fine and bright. Temperature was not, however, much different from the normal for the time of year. In England E., S.E. and the Midlands it was actually deficient. It froze on the grass at Harrogate, Cockle Park (Morperth), Burnley and Greenwich. Rainfall was much below normal, for it was "very light" everywhere, except in England S.E., S.W. and the Midlands, where absolutely no rain fell at all. Sunshine was "abundant" or "very abundant" everywhere. During the whole of the week the weather was anticyclonic, the central part of the anticyclone covering the whole of Great Britain. The wind, which was light, blew generally from between north and east.

The brilliant weather of the latter part of June made up for the storms that took place in the first week. The reports of serious damage to the fruit died away after a few days and were succeeded by reports of large crops. In Scotland it is reported that rain is much needed in the Midlothian districts. Turnips were a fortnight late at the end of the month. Hay was light owing to the cold weather of May and the heat of June. Cereals are reported to be light and short in the straw. Potatoes looked well. The season has everywhere been particularly favourable to insects, and in Midlothian, in addition to the woolly and other aphides, much damage has been done by the magpie moth and currant moth caterpillars. The "grub" is, however, reported to be less prevalent, and rooks are accused of attacking the potatoes in consequence. In Berkshire the whole month has been hot and sunny, except for the 17th when rain fell. Vegetation has gone on well, but rain is much needed. Wheat is coming into ear, but there is not a good prospect. Gooseberries a failure, strawberries and raspberries plentiful. Cherries and apples about half a crop. Hay abundant and put well together. The effects of the heavy snow on April the 25th are now becoming apparent. It is clear that many young birds were destroyed, thrushes, blackbirds and rooks in particular. It is reported that in one rookery where 35 dozen young birds were shot last year, only 13 young birds were shot this year. The reports from Kent are as follows:—The first three weeks very favourable to agricultural crops, then rather scorching; rain wanted for roots. Fly abundant. Early potatoes ceasing to grow from drought. Corn crops good. Clover hay heavy, meadow hay light. Weather most favourable for fruit. Strawberries earlier than usual and good. Good crop of raspberries, nearly ripe. Good crop of gooseberries, now mostly picked green. Weather unfavourable to vegetables.

Germany.—The report issued by the German Statistical Bureau on the state of the crops in the middle of June states that the weather during the previous four weeks was unsettled, but favourable to the growth of crops. Winter

Notes on Crop Prospects Abroad. grain has developed very satisfactorily nearly everywhere, and both winter wheat and early-sown rye give promise of a good harvest, while late-sown rye has also much improved. The condition of the spring grain is not quite so favourable, but it is considered that the outlook is quite satisfactory.

Potatoes were generally planted late and consequently were not sufficiently advanced by the middle of June for an accurate opinion to be formed of their condition. It was frequently stated that they had sprouted unequally and had been checked by wet. A generally favourable growth was only reported from Bavaria. The numerical condition of the crops was as follows :—Winter wheat, 2·1 ; spring wheat, 2·5 ; winter and spring rye, 2·3 ; barley and oats, 2·4 ; potatoes, 2·7 ; (1 = very good, 2 = good, 3 = medium (average), 4 = small, 5 = very small).

France.—The *Journal Officiel* of 14th June gives the official estimate of the area under crops in France on 15th May last, as follows :—Winter wheat, 15,497,000 acres ; spring wheat, 588,600 acres ; winter oats, 1,846,600 acres ; spring oats, 7,718,900 acres ; mixed corn, 380,100 acres ; rye, 2,947,400 acres. The total area under wheat shows a decrease of about 40,000 acres, and that under rye a decrease of 140,000 acres compared with last year. As regards the condition, winter wheat is stated to be good in 39 departments, fairly good in 45, and average in 1. Spring wheat is good in 18 departments, fairly good in 28, and average in 1. Rye is very good in 2 departments, good in 48, fairly good in 32, and average in 1.

Holland.—A report published by the Dutch Ministry of Agriculture on 22nd June states, that the spring crops were not sown under favourable conditions. Until the end of April cold weather was experienced, and as a result the crops were backward, and potatoes and peas sprouted late. Afterwards conditions improved, and the state of the crops is, on the whole, favourable. Oats, barley and beans are generally good, but peas have suffered.

Fruit and Vegetable Crops in Holland.—The Board have received through the Foreign Office an official report dated 6th June, which states that the prospects of the fruit and vegetable crops are on the whole favourable. Some early-blooming fruits, such as gooseberries and currants, have suffered slight damage by night frosts. The condition of apples is good nearly everywhere, but the prospects of the pear crop are less favourable. The other fruit crops are generally reported as good. The condition of early potatoes is good everywhere, except in Utrecht, where it is only fairly good.

Hungary.—The Board have received, through the Foreign Office, a report by H. M. Consul at Buda Pesth dated 15th June, summarising a report by the Hungarian Minister of Agriculture. It is stated that the recent rains have changed but little the condition of the crops which had been endangered by the great drought. (More rain, however, has since fallen.) Vineyards hold out satisfactory prospects, but fruit trees are suffering to a great extent from ravages by caterpillars and cock-chasers.

The areas and the probable yield of the four principal cereals are as follows :—

Wheat	...	...	8,535,000 acres	...	73,848,000 cwts.
Rye	...	...	2,739,000	,	23,764,000
Barley	...	...	2,696,000	,	25,255,000
Oats	...	...	2,645,000	,	22,479,000

Rapeseed has been damaged by insects, and good crops can only be hoped for in regions where the seedlings did not suffer from heat and drought. The same may be said as regards maize, which has hitherto resisted the effects of the heat, but which will require much rain for proper development. Beet has been so severely attacked by insects that in some places a second and even a third sowing was found necessary.

Roumania.—The Board have received through the Foreign Office a despatch dated 10th June from Mr. Consul Wardrop stating that the lack of moisture in Roumania up to the end of May had had a prejudicial effect on vegetation. Cereals and hay have suffered severely and pasturage has dried up almost everywhere. Neither the autumn nor the spring sowings showed any progress during May ; they were short in the straw and thin. The sowing of maize had ended everywhere, and the crop was generally in good condition, especially that sown early, but in some places the drought had already done damage, especially to the later sowings. A despatch dated a few days later stated that a considerable rainfall had occurred in all parts of Roumania which had done much to improve the agricultural outlook. The exportation of forage has been prohibited from 21st June.

Russia.—The Board have received through the Foreign Office a Memorandum prepared by Mr. Scott, Second Secretary at the Embassy, on the condition of the crops in European Russia at the beginning of June. This is a summary of an article in the *Commercial and Industrial Gazette* of June 10th. It is stated that the spring of this year has been cold and late, with the result that the condition of the winter sowings at the beginning of June was, generally speaking, unsatisfactory. The winter-sown wheat crop is reported to have suffered to a greater extent, and over a wider area than the rye crop. It appears to be especially bad in the Governments of Poltava, Tchermgoff, Mohileff, Kieff, Kherson, in the south of Bessarabia, in Koursk, Ekaterinoslav, in the eastern districts of Taurida and in the greater part of Smolensk. It is unsatisfactory in Podolia, Volhynia, Kharkof, the eastern part of the Don Cossack territory, in Grodno and in Lomza. It is satisfactory in the central Volga districts, in the remaining portion of Poland, and in parts of the Baltic Provinces. It is good in the Northern Caucasus.

The condition of the spring crops, although immature in the north on account of the late spring, is considerably better than that of the winter crop, and is described as above the average. It is not reported as being bad anywhere, and is unsatisfactory only in a few localities in the south-western Governments, in Poltava, in the south of Kherson and Taurida, and in parts of the north-eastern Provinces. On the other hand, the area in which it is reported to be good is very extensive, and elsewhere it is expected to yield an average crop. On the whole, given a good rainfall during June, the outlook was regarded as very encouraging for spring grain.

Turkey and Asia Minor.—The Board have received, through the Foreign Office, from H. M. Consul-General at Constantinople a despatch dated 22nd June, in which it is observed that Constantinople depends largely, from a shipping point of view, on the harvests of Southern Russia, Roumania, Asia Minor and Thrace. The Consul-General has received reliable reports to the following effect:—The harvest of Southern Russia promises to be splendid, but a critical period has still to be passed before it is assured. In Roumania the crops are good to medium, and reaping has already begun. In the northern district of Asia Minor, extending from the seaboard to Angora and Eskishehir, the crops good and very good; further south to the Taurus they vary, but are on the whole average. Barley in this district is described as not being so good as last year. Further south, in the Adana district, the harvest is estimated as 20 per cent. better than last year, and better than any for the last eight years. On the north-western side the reports from the Broussa province are moderate, less seed having been sown, and inundations having sterilised a considerable portion of the fertile plain of Mikhaltch. It is doubtful whether there will be much grain for export. In Thrace and the Adrianople district the harvest promises well, and recent rains have practically assured the spring sowings.

Syria.—The Board have received through the Foreign Office a report, dated 4th June, from the British Consul-General (Mr. H. A. Cumberbatch) to the effect that the forthcoming crops in Syria promise, on the whole, to be much better in regard to both quantity and quality than those of the preceding year. This year the barley crop in Gaza promises to be above the average, the estimates varying between 50,000 and 40,000 tons. Deducting about 10,000 tons for seed and reserves, the quantity destined for exportation may be safely calculated at between 25,000 and 30,000 tons. Owing to the depression in most of the Egyptian departments of business, it is very likely that the trade between Gaza and Egypt will be of a very limited character, and that most of the exports will be to the United Kingdom.

The grain exported from Beirut is estimated at 40,000 to 50,000 tons, of which about 30,000 tons will consist of barley and the remainder of peas, beans and wheat. In Lattakia the barley crop is estimated to be about 50 per cent., and wheat about 70 per cent., more than last year. These grains are of rather poor quality, and are largely exported to England. In the Mersina district also the prospects seem very satisfactory, and the increase in the barley and oat crop is estimated at 50 per cent. as compared with last year.

United States.—The Crop Reporting Board of the United States Department of Agriculture at the beginning of June estimated that there was a decrease of 6 per cent. in the area of oats as compared with the estimated area sown last year of 31,644,000 acres. The average condition on 1st June was 92·9 as against 81·6 on the same date in 1907. The acreage reported under barley is estimated at 6,697,000 acres, or about 3·9 per cent. larger than that of last year. The average condition was 89·7 against 84·9 last year.

The Board of Agriculture and Fisheries have been furnished by the Board of Trade with the following report, based on over 200 returns from correspondents in Agricultural Labour various districts on the demand for agricultural labour in June:—

In England during June.

Agricultural employment was generally regular throughout June, the weather causing little or no interruption. Hoeing and haymaking were the chief kinds of work for which day labourers were required, and in most districts they were well employed. In a few districts, however, owing to the dry weather, there was less hoeing to be done than usual.

Northern Counties.—Correspondents in *Northumberland*, *Cumberland* and *Westmorland* report regular employment generally during June, and a fair demand for extra labour. Employment was fairly good in *Lancashire*. In *Yorkshire* hoeing corn, preparing land for green crops, and haymaking generally provided full employment; in certain districts, however, the backwardness of the root crop lessened the demand for extra labour. In the Patrington Union men for hoeing corn were reported as scarce, owing to the non-arrival of Irish migratory labourers.

Midland Counties.—Employment was regular in *Cheshire*, where hoeing, singling turnips and mangels, and haymaking occasioned a full demand for labour. Employment was also regular in *Derbyshire* and *Nottinghamshire*. Hoeing and haymaking provided regular work for labourers in *Leicestershire*. Reports from *Staffordshire* and *Shropshire* state that employment was generally regular, extra labour being in fair demand. The supply of day labourers was usually sufficient. There was a good and constant demand, which was generally met by the supply, for extra labour in *Worcestershire* and *Warwickshire*. A scarcity of men for permanent situations was reported in certain Unions. Employment was regular in *Northamptonshire*, and the supply of day labourers was sufficient. A correspondent in the Wellingborough Union writes:—"The weather has been very favourable for outdoor work, and good progress has been made in securing the hay crop, which requires little labour to get." In *Oxfordshire* the regularity of employment was somewhat affected in certain districts by the dry weather, which caused less work than usual in hoeing. In *Buckinghamshire* the supply of extra labour was usually sufficient, but there was some scarcity of men for permanent situations. In *Hertfordshire* and *Bedfordshire* hoeing and haymaking provided full employment in most districts.

Eastern Counties.—Employment was reported as regular in *Huntingdonshire* and *Cambridgeshire*. There was a fair demand generally for extra labour in *Lincolnshire*; hoeing potatoes, weeding corn, and threshing caused a demand for day labour, the supply of which was reported as insufficient in certain Unions. Hoeing, weeding and haymaking generally provided regular employment in *Norfolk* and *Suffolk*; the supply of extra labour was fully equal to the demand. Outdoor work was regular and plentiful in *Essex*, and many persons found employment in pea-picking. The supply of extra labour was generally equal to the demand, but one correspondent mentions that the hay crop was too heavy in places for machinery, and more men were wanted for mowing than could be found.

Southern and South-Western Counties.—Employment was regular in *Kent*; there was some surplus of extra labour, although fruit-picking and haymaking caused a large demand in certain districts. Hoeing and haymaking generally provided full employment in *Surrey*. Day labourers were generally in regular employment in *Sussex* and *Hampshire*. In *Berkshire* and *Wiltshire*, owing to the dry weather, there was less hoeing to be done than usual, and less hand labour required for haymaking. Day labourers were in fair demand, but the supply was usually sufficient. There was generally full employment in *Dorset* and *Somerset*; some scarcity of day labourers was reported from the latter county. Reports from *Herefordshire* state that employment was regular. The supply of and demand for extra labour were generally about equal. Hoeing and haymaking offered a good deal of work in *Gloucestershire*, but the supply of day labourers was generally sufficient. There was regular employment in *Devon* and *Cornwall*.

EARNINGS OF IRISH MIGRATORY LABOURERS IN 1907.

In the Second Report on the Wages and Earnings of Agricultural Labourers in the United Kingdom, published by the Board of Trade (Cd. 2,376 of 1905), an account is given of Irish migratory labourers, a large number of whom go every year from Ireland to work on farms in certain counties of England and Scotland.* Some of these labourers "start as early as February, and take part in the ordinary work on farms, not returning until late in the autumn; but the majority do not start until June. They find employment during the summer and autumn at hoeing, haymaking, harvesting, and taking up potatoes and roots, and on dairy farms in parts of Cheshire they are engaged at milking. In this county Irishmen begin to come in February, and some stay until November or even December."

In the autumn of last year the Board of Trade addressed an inquiry to certain employers in England and Scotland respecting the earnings of Irish labourers of the class referred to, employed on their farms during the season of 1907. It has not been found practicable to summarise the information obtained owing to the variety in the periods of employment, conditions of work, and allowances of food, &c., on the different farms. The examples given below of amounts earned on certain farms may, however, prove interesting as illustrating the conditions under which the Irish labourers work in different counties.[†]

Northumberland.—An employer in Northumberland gives particulars respecting the employment of five Irishmen from the County of Mayo. These men worked from 17th June to 15th August, and together earned £65 2s. 10d. They were provided with sleeping accommodation in an outhouse and were given 12 cwts. of coal. During the season they worked for two days on a neighbouring farm, and there earned about £2 10s. between them. Including this amount, the average weekly cash earnings per man for the whole period were about 31s. 3d. On completing their engagement they returned direct to Ireland.

Durham.—On a farm near Chester-le-Street four men from the County of Mayo were employed from 24th June to 18th July. Their total cash earnings amounted to

* The Report on Irish Migratory Labourers issued by the Department of Agriculture and Technical Instruction for Ireland (Cd. 3481 of 1905) states that "From the evidence obtained at various sources it appears that the number of migratory labourers who went to England and Scotland in 1906 was very similar to that of the preceding year, and may be estimated at approximately 25,000." The figures for 1907 are not yet available.

† It may be of interest to note that Irish labourers travelling from Westport to Liverpool *via* Dublin pay 12s. or 13s. for the single journey. The fare by boat from Westport or Ballina to Glasgow is 5s. for the single journey.

£13 5s. 4d., or an average of 18s. 1d. each per week, and in addition they were provided with sleeping accommodation in a granary and were given milk. They also had an allowance of beer when working hay. These men came direct from Ireland, and sought other work in England after completing their engagements.

On a farm near Birtley four men from Mayo were employed, and their cash earnings amounted to £7 2s. 3d. each. They were provided with sleeping accommodation in a granary and were given tea. One man who had been working in a coal mine remained on the farm for harvest, but the other three who had come over direct from Ireland returned at the end of their engagement.

Lancashire.—An employer near Widnes gives particulars respecting two men from Mayo who were employed from June 24th to November 10th. Their total cash earnings amounted to £18 18s. each (or an average of 18s. 11d. per week). They were provided with sleeping accommodation, coals, &c., but found their own food. During hay and harvest time they were allowed five pints of ale per day. On completing their engagements one obtained employment at a copper works, while the other returned direct to Ireland.

Yorkshire.—On a farm near Hull seven Irishmen from Mayo were engaged. They were provided with sleeping accommodation in a corn granary, and were allowed beer. Their cash earnings while employed on this farm were as follows:—

	Total Cash Earnings.	Period of Employment.						Average Weekly Earnings.
		August	6th to October	6th	...	...	...
1.	£ 11 1 0							£ 1 5 0
2.	11 1 0	"	6th to	"	6th	...	...	1 5 0
3.	10 12 0	"	8th to	"	5th	...	...	1 4 11
4.	10 6 0	"	11th to	"	1st	...	...	1 8 1
5.	9 10 0	"	11th to	"	5th	...	...	1 3 9
6.	9 14 0	"	11th to	"	6th	...	...	1 4 3
7.	10 6 0	"	15th to	"	6th	...	...	1 8 1

All these men worked at haymaking before commencing work on this farm, and on leaving they went to other farms in England for potato digging.

Another employer in Yorkshire gives particulars respecting the employment on three farms of nine Irishmen from Mayo. Their total cash earnings amounted to £68 15s., or an average of 25s. 9d. per week for each man, and in addition they were all provided with sleeping accommodation in an outhouse or barn, and given lunch and beer. Each of them worked at hay harvesting in Lancashire before commencing work on these farms, and on terminating their engagements two returned to Ireland, while the others sought further employment in England.

Derbyshire.—On a farm near Derby five Irishmen from Mayo were employed for the hay harvest. Four of them received from 15s. to 16s. per week, and were provided with beds and food and drink. The other received 18s. per week, and 10s. extra at harvest, but he received no allowances other than beer.

Cheshire.—One man from County Roscommon was employed on a farm in Cheshire from 24th June to 31st October. His total cash earnings amounted to £14 10s., or an average of 15s. 6d. per week, and in addition he received beer, and about half his food during the harvest, which lasted about ten weeks.

Another employer in Cheshire had six labourers from County Sligo, to each of whom he paid 16s. per week till the end of June, and then 19s. per week and 6d. per hour for whatever overtime they made. All were given food at harvest time, and those who were engaged in milking were provided with dinners on Sundays.

Staffordshire.—On a farm in Staffordshire two men from Galway were employed

from 24th June to 15th August. Their total cash earnings amounted to £6 each (or 15s. 8d. per week), and in addition they were provided with sleeping accommodation and food and drink. They afterwards went into Lincolnshire for the corn harvest.

Lincolnshire.—An employer in the Spilsby Union furnished particulars of the earnings of 20 Irish labourers who worked from August to October on his farm. Most of the men come from Sligo, and all of them had been haymaking in Yorkshire, Durham, or Lancashire before coming to him. The aggregate cash earnings of the 20 men amounted to £263 18s. 4d., which yields an average of £13 3s. 11d. per man, or, taking into account the aggregate number of days worked, 30s. per week per man. Nearly all of these returned direct to Ireland. They slept in a barn on straw, and were allowed fuel and about 18 gallons of beer each during the period referred to.

Another employer in Lincolnshire had 12 men from Roscommon working at potato picking on his farm from October 7th to 31st. Their total cash earnings amounted to £87 15s. 1½d., giving an average of 41s. 9d. each per week. These men were provided with sleeping accommodation and coal and potatoes.

Worcestershire.—On a farm near Evesham five Irishmen from Mayo were employed from June to October, and their cash earnings averaged about £1 per week. They were provided with sleeping accommodation in a small house, and were given fuel free. The employer states that these men have come to him every summer “some of them for twenty years.” He remarks that “the men live very cheaply and send most of their earnings home—as soon as they arrive they borrow money to send home, and it is very rarely a man goes away without paying the money we advance to him.”

Warwickshire.—Information respecting seven men from County Mayo was received from two employers in Warwickshire. On one farm six men were employed and were paid at the rate of £1 per week with sleeping accommodation and fuel. On the other farm a man was paid 18s. a week for about 24 weeks with an extra allowance of £2 10s. He was also provided with sleeping accommodation and fuel and beer.

Scotland.—Returns have been received relating to 162 Irish labourers employed on 21 farms in Scotland. The majority of these men were from Donegal. The employers generally lodged them in a bothy or other building free of charge, and provided porridge and milk night and morning as well as some bread and beer during the day; also fuel. On a farm in the county of Wigton four men were employed during the harvest of five weeks, their cash earnings amounting to £4 15s. each, or an average of 19s. per week.

An employer in Dumbartonshire gives particulars of the earnings of 10 men from County Donegal. Their aggregate cash earnings amounted to £197 2s., or an average of 16s. per man per week. These men came direct from Ireland and returned to their homes in October.

Seven men who had been working all the summer in Fife and Midlothian were employed on a farm in Berwickshire from September 9th. Four of them returned to Ireland on the 19th October, their cash earnings on this farm amounting to £6 18s. each (23s. per week). The other three men left on 26th October, and went to other employment in Scotland, their cash earnings amounting to £8 2s. 4d. each (23s. 2d. per week).

On another farm in Berwickshire 19 men were employed. Their cash earnings amounted to £90 12s., or an average of 18s. 8d. per man per week. Employment continued from September 11th to October 29th, during which time 10 of the men left to seek employment elsewhere; those who remained returned direct to Ireland.

Information has been received from nine potato merchants in Scotland as to the employment of Irish labourers for potato lifting. These merchants employed about 592 persons (238 males and 354 females) in the season of 1907, and their total cash earnings are estimated at £10,570. Most of the parties of labourers arrived in Scotland about the middle of June and remained until the end of November. In

addition to daily wages of 5s. per "grape" (two persons), they were provided with sleeping accommodation, and as many potatoes as they required for their own use. The potato merchants give voluntary testimony to the character of the Irish people in their employment. In one of the reports it is stated that the labourers have "done good work, always cheerful and ready to work." Another employer remarks that his squad were "extremely well behaved, no drunkenness or rioting," and that "earning money to send home is their principal object," while another states that "the class of labourers was fully up to the average, and gave us every satisfaction."

Importation into France of Dodder and Forage Seeds containing Dodder.—The French *Journal Officiel* for the 30th April contains a Presidential Decree, dated the 21st February, prohibiting the importation into France of dodder (*cuscute*) and forage seeds containing dodder.

Miscellaneous Notes. Annexed to the Decree is an Order of the Minister of Agriculture prescribing the procedure to be followed in connection with the Customs examination of imported forage seeds, in order to ascertain whether or not they contain dodder.

Phosphates in the Society Islands.—H.M. Consul at Tahiti reports the discovery of very large deposits of phosphates in these Islands. It is estimated on reliable authority that in one island there are 30,000,000 tons of crude phosphate, containing 65 to 85 per cent. of pure phosphate. (*Board of Trade Journal*, 21st May, 1908.)

International Plant Protection.—Dr. Paul Sorauer, the editor of the *Zeitschrift für Pflanzenkrankheiten*, has issued the first number of a new supplement to that publication entitled *Internationaler Phytopathologischer Dienst*. Dr. Sorauer explains that the object of this supplement is to form a connecting link between investigators into plant diseases in all countries, and a medium for the dissemination of the results of scientific inquiries and the announcement of the appearance of new forms of disease. Great importance is attached to the latter point, and the American Gooseberry Mildew is mentioned as an example of a disease, which has established itself in many countries because its injurious character was not recognized in time.

A Weed of Pastures.—During May the Board received from Hayes, Kent, specimens of a composite weed, which was identified as *Crepis taraxacifolia*, Thuill. This is a bristly, branched weed of one or two feet in height, which, according to Hooker, occurs more or less locally, from Yorkshire to Cornwall and Kent, and in Carnarvon. It favours dry calcareous pastures and banks, and is a biennial, flowering taking place in June and July. The plant should be regularly cut down before flowering takes place, in order to prevent seeding. A dressing of 6 cwt. of superphosphate and 1 cwt. of sulphate of ammonia might do good by encouraging a better type of herbage, which would tend to crowd out the weed. Close grazing with sheep or geese in spring might also be tried.

Meadow Saffron in Switzerland.—With reference to the article on Meadow Saffron which recently appeared in this *Journal* (April, 1908, p. 44), it may be noted that the poisonous qualities of this weed in Switzerland are referred to by Stebler and Schroeter (*Matten und Weiden der Schweiz*, Vol. IX, p. 209). Cases of poisoning of household animals and human beings are recorded every year. Horses are poisoned either by the green plant or by the leaves chopped up in the hay. Cattle, as a rule, appear to avoid it, whether in the meadow or in the crib, but young animals are frequently poisoned. Poisoning also often occurs in the early spring when beasts fed in the stall during winter are let out on the young grass. Pigs are also affected, but sheep and goats appear to be more or less immune. Warm milk is used as an antidote.

Report on proceedings under the Tithe, Copyhold and other Acts.—The statutory reports required to be laid annually before Parliament by the Board of Agriculture

and Fisheries, as the successors of the Tithe, Copyhold and Inclosure Commissioners, are included in the Report by Mr. R. H. Rew on the proceedings of the Board during 1907 under the Acts relating to Tithe, Copyhold, Inclosure and Commons, Land Drainage, Light Railways, Improvement of Land, Settled Land, Glebe Lands, Universities and College Estates, and Agricultural Holdings. This Report (Cd. 4127) may be obtained from the usual Agents, price 2d.

Machinery Trade of Rostov-on-Don.—H.M. Consul at Rostov-on-Don (Mr. A. F. Medhurst) has forwarded the following particulars respecting the trade there in machinery and engines during 1907:—

The business done in steam thresher sets, ploughs and drills was good, and that in reapers, mowers and horse rakes bad. There is no improvement to note in the terms of payment, which continue to be spread over long periods, varying from two to four years, heavy interest being paid by the purchaser. Prices were well maintained, and farmers brought in their money punctually—indeed, in many cases they anticipated the due dates, for, having received good prices for their crops, they feared to take the money with them to the villages, where robbery was very frequent.

The sales of ploughs were very heavy. Disc ploughs continue to be actively pushed, and appear to give satisfaction, but the price of this plough—£16 for a double and £12 for a single one—causes it to be beyond the reach of the average farmer in the Rostov district. A strong and steady demand was noticed for multiple ploughs with seeders attached. These are manufactured by Russian makers and sold at £6 per plough (four furrow).

Drills sold very well. They are of Russian make and appear to have quite superseded hand sowing.

The total sales of reapers, mowers and horse rakes was some 40 per cent. less than in 1906. Shortness of straw caused many farmers to cut their grain by hand instead of buying machinery, and in some districts (Goulkeyvitchy and Armavir in the Caucasus) the peasants destroyed several machines in order to intimidate the farmers and cause them to employ more hands. They succeeded in their object and many local merchants either cancelled or much reduced their buying orders. (*Board of Trade Journal*, 4th June, 1908.)

Correction.—In the article on “Apple Scab or Black Spot” in the previous issue of the *Journal*, June, 1908, the quantity of water to be used in the winter wash mentioned at foot of p. 194, should have been given as 50 gallons instead of 50 lbs.

The Board of Agriculture and Fisheries, by virtue and in exercise of the powers vested in them under the Destructive Insects and Pests Acts, 1877 and 1907, do order, and it is hereby ordered, as follows:—

Destructive Insects and Pests Order of 1908.

Notification of Discovery of Insect or Pest.

1. The occupier of any premises on which an insect or pest mentioned in the Schedule to this Order is discovered, shall forthwith notify the fact to the Board, with particulars of the time and place of discovery; and, where practicable, a specimen of the insect or pest shall accompany the notice; provided that these provisions shall not apply to an insect or pest in any museum or collection; provided also that notification under this Article shall not be necessary where similar notification to the Clerk to the Local Authority or to some person authorised by the Local Authority to receive such notification is made in pursuance of some other Order of the Board.

Powers of Entry.

2. An Inspector or other officer appointed in that behalf by the Local Authority and any Inspector of the Board may, upon production if so required of his appointment or authority, enter any lands on which he has reason to believe that an insect or pest mentioned in the Schedule to this Order exists or has recently existed, and examine any tree, bush, plant or crop on such lands.

Prohibition of Sale of Specimens.

3. It shall not be lawful, except with the written permission of the Board, to sell or expose or offer for sale or keep a live insect or pest mentioned in the Schedule to this Order.

Offences.

4. Every person shall be liable on conviction to a penalty not exceeding ten pounds, who—

- (1) Knowingly fails to give such notification of discovery of an insect or pest as is required by this Order; or
- (2) Sells or exposes for sale or keeps an insect or pest in contravention of this Order; or
- (3) Wilfully obstructs or impedes any Inspector or other officer when acting under this Order.

Revocation of Order.

5. The Colorado Beetle Order, 1877, is hereby revoked.

Definitions.

6. In this Order—

“The Board” means the Board of Agriculture and Fisheries;

“Local Authority” means a local authority having power to execute and enforce the Diseases of Animals Act, 1894; and “District” means the area in which the Local Authority has such power to act.

Application of the Order.

7. This Order shall apply to Great Britain.

Short Title.

8. This Order may be cited as the Destructive Insects and Pests Order of 1908.

In witness whereof the Board of Agriculture and Fisheries have hereunto set their Official Seal this eighteenth day of June, nineteen hundred and eight.



T. H. ELLIOTT,
Secretary.

SCHEDULE.*Insects to which this Order applies.*

The Vine Louse (*Phylloxera vastatrix*, Planchon).

The San José Scale (*Aspidiotus perniciosus*, Comstock).

The Mediterranean Fruit Fly (*Ceratitis capitata*, Wiedemann).

The Colorado Beetle (*Doryphora decemlineata*, Say).

The Large Larch Sawfly (*Nematus Ericksonii*, Hartig).

Pests to which this Order applies.

Black Knot (*Plowrightia morbosaa*, Saccardo).

White Root Rot (*Rosellinia necatrix*, Prillieux et Delacroix).

Black Scab or Warty Disease of Potatoes (*Chrysophyctis endobiotica*, Potter (?), of Schilbersky).

The American Gooseberry Mildew (*Sphaerotheca mors-uvae*, Berkeley and Curtis).

REVIEW OF MARKET PRICES IN JUNE.

A. T. MATTHEWS.

First week.—The Metropolitan Market at Islington on the first day of the month was supplied with 1,020 fat cattle, and Thursday's market brought the total to 1,140, which gave London the sixth place on the list of scheduled markets for the week as regards the numbers on offer. The quality of the animals generally was good, and this also applies to most of the country markets. It has, in fact, been the subject of general remark that cattle have been turned out lately in better condition than usual. Trade, however, was rather disappointing, owing partly to the hot weather, and prices declined $\frac{1}{2}d.$ per lb., 7d. being the maximum figure, or $\frac{1}{2}d.$ per lb. less than the highest which had yet been reached, $7\frac{1}{2}d.$ having been touched on 18th May. This check to the steady improvement in beef values was, however, by no means uniform throughout the country, nearly half the markets being very firm, and a few recording an advance. At others the supplies were rather too heavy for the demand, and amongst these were Hereford, Ipswich, Leeds, Leicester, Liverpool, Newcastle, Shrewsbury, York, Dundee, Glasgow and other important centres.

The very moderate supply of 8,100 sheep and lambs at Islington, of which 7,130 were offered on the Monday, met a very slow trade, except the few light-weights on offer, which sold readily enough at previous rates. The top price of English Downs was $8\frac{1}{2}d.$ per lb., but some prime Scotch half-breds reached 9d. For all wethers exceeding 72 lbs. in weight less money had to be accepted. Small lambs fetched up to 11d. per lb., but there were plenty of heavier ones which did not exceed 10d. The country markets for sheep, like those for cattle, varied considerably, and it is interesting to note that many of these showed a growing preference for small weights. At about nineteen centres in England and Scotland prices were rather easier, while at eighteen they were well maintained. As regards relative values the top price of Down tags exceeded that of London at seven places. These were Chichester, Dorchester, Shrewsbury, Ruthin, Derby, Newcastle and Salford, the last named being, as it frequently is, the dearest of the English markets. In the markets for dead meat there was no particular excitement during the first week, though prices of fresh beef were above the normal level of late years. Scotch short sides sold at 65s. 4d. per cwt., and long sides at 58s. 4d. for first quality in the London Central Market, while English stood at 57s. 2d., and port killed American at 59s. 6d. The variations of these prices in relation to each other at different markets are worthy of note here. English beef was dearer at Birmingham, Leeds and Manchester than in London, their prices being 58s. 4d., 59s. 6d. and 58s. 4d. respectively, while port killed, on the contrary, was considerably cheaper in the country. Against London's 59s. 6d. we have Birmingham, 54s. 10d.; Leeds, 56s.; Manchester, 56s.; Liverpool, 58s. 4d., and Glasgow, 56s. In American chilled hind quarters we have another curious variation, these being much the lowest in London. Here, this class was fetching only 59s. 6d., while in Birmingham it was worth 63s.; Leeds, 61s. 10d.; Manchester and Liverpool, 60s. 8d.; Glasgow, 60s. 8d.; Edinburgh and Dundee, 63s. The arrivals of live cattle at Deptford were small, and the trade was evidently in a very uncertain state. Frozen beef was not yet at all affected by the shortage of fresh killed, and salesmen complained of a very bad trade. Taking the average of hind and fore-

quarters, the price at London of New Zealand beef was 31s. 6d. per cwt. for first quality, while Argentine made 30s. 4d., and Australian 33s. 10d.

The trade for fresh mutton was quiet in London, the best Scotch only realizing 8½d. per lb., and English 7½d. Both were fetching more in some other markets, Scotch making up to 84s. per cwt. in Manchester against London's 77s., while at Liverpool it was 81s. 8d. The price of English mutton was 70s. in London, Birmingham and Leeds, 79s. 4d. at Manchester, and 74s. 8d. per cwt. at Liverpool.

London was by far the cheapest market for Argentine frozen mutton, the price there being only 31s. 6d. against 35s. in six of the leading country markets. New Zealand mutton always sells at considerably more money than Argentine, and made 42s. in London and Glasgow. Best British lamb was much more even in value, fetching 98s. in London, Birmingham and Leeds, and 102s. 8d. in Glasgow and Dundee. In Liverpool and Manchester lamb was exceptionally cheap, the quotations being 91s. and 88s. 8d. respectively.

The quotations for veal are frequently very irregular, the supplies at most markets being extremely uneven. It sometimes happens that, in London, first quality of British cannot be quoted at all, that on offer being only second rate. During the week in question there was no English veal making more than 60s. 8d., while in Liverpool best English sold at 77s.

Second week.—Whitsuntide, being a very popular holiday in London, is generally a very poor week for the Metropolitan Cattle Market, but that held on Whit-Monday formed a significant exception so far as beef was concerned. The supply of 640 head on that day made a fair show for such an occasion, and the quality was well maintained. Usually on any Bank-holiday, many would have had to be held over, but buyers for the Central Market were present, and every beast was quickly bought up. An advance of ½d. per lb. was freely given, and many more might have been sold. The brisk trade of London was scarcely followed in the provincial markets, but in very few places was there any reduction. At Hereford, Newport, Hull, Liverpool, Norwich, Aberdeen, Castle Douglas and Perth there was a slight downward tendency for beef, but at Bristol, Dorchester, Ipswich, Leeds, and most of the Scotch markets there was some improvement in prices, while other markets were more or less firm at previous rates. Sheep at Islington numbered 4,600, but the demand contrasted strongly with that on the cattle side of the enclosure. Trade ruled very slow, but prices were unchanged. Prices were a little better at Crewe, Hull, Leicester, Peterborough, Wolverhampton, York, Aberdeen, Edinburgh, Glasgow and Perth, more or less lower at Ashford, Darlington, Denbigh, Derby, Exeter, Hereford, Ipswich, Norwich, Elgin and Inverness, and at all other places were unchanged. Best Down tegs were returned at 8½d. per lb. in London against 8½d. at Salford and Crewe, 8½d. at Dorchester, Shrewsbury, Derby and Newcastle, and 7½d. at Hereford, Norwich and York. Lambs were in moderate demand at singularly even prices, 11d. being the top figure in the English markets except at Hull and Newcastle, where the best made 11½d.

The feature of the week in the London dead-meat trade was a distinct advance in fresh killed British beef and a very slight one in American chilled quarters. Port killed was stationary or even a little easier. So also was Argentine chilled, but frozen remained unchanged. Scotch short sides touched 7½d. per lb., long sides 6½d., and English 6½d., the last being exactly the same as Deptford killed. Frozen beef sold at former prices. It is now fully recognized that the short American supply is the sole cause of the

upward movement in values, and yet the average of the best chilled hind and fore quarters, that is the whole side, was only 3s. 6½d. per 8 lb., or about 5½d. per lb. London was clearly ahead of all other markets in value of British and port killed beef during the second week of June. There was an advance of ½d. per lb. in Scotch mutton and ½d. in English, other markets bearing about the same proportion as to relative prices. Lamb was unchanged at London, dearer at Manchester and Liverpool, and cheaper in the Scotch markets. Veal recovered slightly at London, but was lower at the country markets, while pork was very dull.

Third Week.—Fat cattle were again in sharp demand at Islington on the third Monday, and the 870 on offer were quickly cleared off at a further advance of ½d. per lb. The general quotation was 7½d. per lb. for the best quality Norfolk cattle, but many buyers insisted that their purchases would cost them more when slaughtered and weighed, which, of course, often happens. The highest price by live weight was 42s. 10d. per cwt. Very nearly all the English markets and the whole of the principal ones in Scotland held during the week recorded a rise. It is usual, just at this season, when stall and yard-fed cattle are getting into small compass and grass-fed beasts are barely ready, for trade to be somewhat better, but it had become evident by the middle of the month that from some outside cause, home grown beef was in better demand and realizing higher prices than for many years. There is no reasonable doubt that many choice cattle were sold at 8d. per lb. No fewer than five of the principal markets reported Shorthorns at 7½d., and of course Devons and Polled Scots made rather higher prices. Any serious advance in the value of one important class of meat must have some effect on all if continued for any length of time, and when we carefully examine the sheep markets we see that there was more life in the trade than for some time past. Sheep on the 15th were a quiet trade at Islington, but prices, though nominally unchanged, were firm, and former rates were more easily obtained. This was generally the case throughout the country, and at fifteen markets, six of which were Scotch, an advance was established. Only two were lower and the remainder firm. One feature at Islington was the first appearance for the season of Kentish Long wools, of which there was rather a large consignment. They were much too heavy for the first-class London trade, but were saleable at about 7d. per lb. Lambs were a steady trade at 11d. per lb. for the best small weights, but at three markets in Scotland 1s. was freely paid.

The dead-meat trade of the week presented several noteworthy features. American chilled advanced ½d. per lb. on the Wednesday, and on Friday there was a further upward movement in all fresh-killed beef. More significant, perhaps, was that frozen beef at last began to advance, being dearer by ½d. on Wednesday, bringing best hind quarters to 4d. per lb. and fore-quarters to 3d. In the country markets American chilled beef was dearer than in London, but port-killed was decidedly the reverse. Mutton was rather lower for Scotch and English, but frozen was unchanged and still very cheap. Best English was nearly 4s. per cwt. higher in Liverpool and some other northern markets than in London. There was rather a heavy fall in lamb at the Central Market, the best fetching only 9½d. per lb.

Fourth Week.—The fourth week opened with a much quieter market at Islington on the 22nd. There was a larger supply of cattle by about 200, amongst which were some very good grass-fed Lincoln Red Shorthorns. It

seemed as if the raising of the retail price to the consumer had taken immediate effect on the demand, for the buyers for the Central Market who had cleared the market in recent weeks were conspicuous by their absence. Trade was therefore slow, but prices remained firm and sellers would make no concession. Grass-fed bullocks fetched 7d. per lb. and prime yard-fed 7½d. No less than twenty of the country markets were quoted higher during the week, eleven were unchanged and firm, and only two or three were lower, the highest price for Shorthorns being recorded at Newcastle, where 9s. per 14-lb. stone was reached.

The shortage and consequent comparative dearness of meat is on this occasion entirely confined to beef, for sheep have shown no further advance in London and were decidedly lower in the country during the last days of the month. At Islington on the 22nd the sheep trade was decidedly dull and lifeless, and late prices were maintained with difficulty, while at no country markets was any advance made; in fact most of them showed a decline.

The position of the beef trade in the dead-meat market the same week was peculiar. Prices were undoubtedly higher, but the demand was plainly checked and business was very slow. In London Scotch long sides advanced ½d. per lb., and the same may be said of English. Port-killed was ¼d. to ½d. higher, but American chilled hind quarters went up 1½d. with a bound and Argentine ¾d. There was a visible tendency in some quarters to fall back on frozen beef, and this article accordingly showed a total rise in London of ½d. per lb. in the fortnight. The leading country carcase markets exhibited the same features, and therefore call for no comment.

As might have been expected, the trade for store stock, especially cattle, has remained very firm throughout the month, yet the demand has not been particularly keen, prices being too high for the hope of profit. Cattle have frequently realized as much per cwt. in store condition as the current rates for beef. The low price of wool, which has declined something like 25 per cent. since last year's clipping, has been against the trade for store sheep.

Latest.—The market at Islington on the 29th was fairly supplied with beef cattle, but the bulk of them were grass-fed. There were 960 on offer, and amongst them a lot of very good Herefords. Trade was slow, and prices receded at least ½d. per lb. all round. The best Herefords made 7½d. and the finest Norfolks 7½d. The reduction might be fairly accounted for by the decline in quality, or rather, finish, of the animals. Sheep were 1,000 more in numbers than the previous week, and prices were fully ½d. per lb. in buyers' favour. The latest news from the dead-meat market is to the effect that prices are falling.

REVIEW OF THE PROVISION TRADE IN JUNE.

HEDLEY STEVENS.

Bacon.—During the early days of June, the demand was disappointingly slow, and prices favoured buyers. Later, as the weather became more settled and warmer, the demand for both bacon and hams increased, and prices became gradually firmer. The arrivals of Danish bacon are still in excess of last year, and the receipts in London alone were 8,000 bales above the

quantity imported during June, 1907. There has been a big range of prices for this meat during the month, namely, from 48s. at the commencement, up to 62s. by the end of the month. Canadian sides also rose from about 52s. up to 60s. and 61s.; the arrivals are still very much reduced, on account of the continued high prices of pigs in Canada.

Irish bacon started the month about 8s. to 10s. below the prices current at the same time last year, but by the end of the month had advanced 2s. to 3s. above last year's prices in sympathy with the advances on imported meats. English bacon made an advance during the month of 2s. to 4s. English pigs have not been marketed freely, farmers presumably being too busy haymaking to spare the time.

Cheese.—On account of the hot weather experienced during the first few days of the month, the demand for cheese increased, and both old and new makes quickly advanced 1s. to 2s. on spot. This cause, in conjunction with the continued small receipts of Canadian at Montreal (caused chiefly by the backward season), and the reduced stocks in England, caused prices to advance steadily, and Canadian shippers were able to put up their prices almost daily, making as high as 59s. c.i.f. towards the end of the month for best Canadian cheddars, which is abnormally high for the June manufacture. Later, a slight reaction set in, with prices 1s. to 2s. lower, and receipts from factories daily increasing.

The Canadian pasturage is reported to be in very fine condition, but information from reliable sources confirms the opinion that the make of cheese will not be excessive, chiefly on account of the smaller number of milking cows, and the increasing demand from Western Canada for condensed milk; supplies are thus being used which would otherwise go into cheese and butter production.

The spot prices for Canadian at the beginning of the month were 4s. to 6s. under last year, but by the end they had advanced to about the same level as those current during June, 1907.

A fair make of English is in progress, but farmers already report a falling-off in the flow of milk because of the hot, dry weather, which also increases the demand for milk for drinking purposes.

Butter.—The abnormally high prices continue, and at present there are no signs of a downward turn. All selections are fully 15s. per cwt. above the average for the time of year, and with the absence of any stored stocks, still higher prices in the near future may be anticipated, should the present hot and dry weather continue here and on the Continent. The arrivals of Siberian have been disappointingly small for the month of June. The first shipment of Canadian creamery butter this season, viz., 1,522 boxes (each 56 lb. net), left Montreal on 6th June for Bristol, and found a ready sale on arrival, at prices remunerative to the importers. Since that date shippers have advanced their prices 5s. to 7s. per cwt., and report continued small receipts.

Eggs.—The demand has been above the average for the time of year. A drop in prices was generally expected after the Whitsuntide orders had been filled, but the reverse has been the case. The rise began with Irish eggs, and, foreign arrivals being small, all grades steadily advanced. At the end of the month the demand has decreased, doubtless on account of the extremely hot weather prevailing. The present prices are about the same as those of last year.

PRICES OF AGRICULTURAL PRODUCE.
AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND
in the Month of June, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—				
Cattle :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Polled Scots	s. d. 8 8	s. d. 8 3	s. d. 39 5	s. d. 36 4
Herefords	8 6	7 11	—	—
Shorthorns	8 3	7 7	38 7	35 10
Devons	8 8	7 8	—	—
Veal Calves	per lb.* d. 8½	per lb.* d. 7½	per lb.* d. 8½	per lb.* d. 6½
Sheep :—				
Downs	8½	7½	—	—
Longwools	7½	7	—	—
Cheviots	8½	8	9	7½
Blackfaced	8	7½	8½	7½
Cross-breds	8	7½	8½	8
Pigs :—	per stone.*	per stone.*	per stone.*	per stone.*
Bacon Pigs	s. d. 5 10	s. d. 5 3	s. d. 6 0	s. d. 5 3
Porkers	6 2	5 7	6 3	5 6
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk	20 15	17 16	22 12	17 12
,,—Calvers	21 2	17 9	19 3	16 14
Other Breeds—In Milk	21 5	14 13	18 17	15 2
,,—Calvers	14 5	13 15	18 10	15 8
Calves for Rearing	2 7	1 18	2 15	1 16
Store Cattle :—				
Shorthorns—Yearlings	10 18	9 8	10 12	8 14
,,—Two-year-olds	15 0	13 11	15 6	12 16
,,—Three-year-olds	18 0	15 12	17 7	15 7
Polled Scots—Two-year-olds	—	—	16 7	13 19
Herefords—	15 11	14 7	—	—
Devons—	15 8	14 0	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs, and Lambs—				
Downs or Longwools	45 8	37 10	—	—
Scotch Cross-breds	—	—	38 5	33 4
Store Pigs :—				
Under 4 months	21 6	15 11	20 9	17 5

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of June, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birming-ham.	Man-chester.	Liver-pool.	Glas-gow.	Edin-burgh.
BEEF :—		per cwt. s. d.					
English	1st	60 0	58 6	60 0	—	58 6*	58 6*
	2nd	58 0	54 0	56 6	—	57 0*	52 6*
Cow and Bull	1st	45 0	52 6	51 6	49 0	49 0	46 6
	2nd	39 0	45 6	45 6	42 6	42 0	40 6
U.S.A. and Cana-dian :—							
Port Killed	1st	60 6	55 6	56 0	58 6	56 6	—
	2nd	55 0	50 0	53 0	53 6	50 0	—
Argentine Frozen—							
Hind Quarters	1st	36 0	36 6	36 0	35 6	35 6	37 6
Fore " "	1st	27 6	29 6	28 6	28 6	28 6	29 0
Argentine Chilled—							
Hind Quarters	1st	54 0	54 0	53 0	53 0	53 6	52 6
Fore " "	1st	34 0	35 0	35 0	32 6	37 6	32 6
American Chilled—							
Hind Quarters	1st	64 6	66 0	64 6	64 6	60 6	67 0
Fore " "	1st	41 6	43 6	42 6	42 6	42 0	44 6
VEAL :—							
British	1st	65 6	69 0	71 0	75 0	—	—
	2nd	60 0	57 6	65 6	69 0	—	—
Foreign	1st	66 0	—	65 6	—	—	64 6
MUTTON :—							
Scotch	1st	77 6	—	83 0	81 0	78 6	75 0
	2nd	70 6	—	77 0	74 6	70 0	62 0
English	1st	71 6	70 0	78 0	74 0	—	—
	2nd	63 0	59 6	70 0	68 0	—	—
U.S.A. and Cana-dian :—							
Port killed	1st	—	—	71 0	71 6	—	—
Argentine Frozen	1st	31 6	35 0	35 0	34 6	33 0	34 6
Australian "	1st	31 6	34 6	32 6	32 0	35 0	—
New Zealand "	1st	40 0	—	—	—	42 0	—
LAMB :—							
British	1st	92 0	94 6	90 0	89 0	98 0	88 6
	2nd	83 0	84 6	84 6	81 6	88 6	86 6
New Zealand	1st	53 6	55 0	53 0	52 0	53 6	57 6
Australian	1st	46 0	47 0	45 0	45 0	46 6	46 6
Argentine	1st	44 6	48 0	47 0	45 6	44 6	—
PORK :—							
British	1st	48 6	60 0	56 0	56 0	51 6	49 6
	2nd	44 6	52 6	49 6	51 6	—	39 0
Foreign	1st	45 6	52 0	52 6	52 6	—	—

Scotch.

AVERAGE PRICES of British Corn per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1906, 1907 and 1908.

Weeks ended (in 1908).	Wheat.			Barley.			Oats.			
	1906.	1907.	1908.	1906.	1907.	1908.	1906.	1907.	1908.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Jan. 4	28	4	26	0	35	1	24	6	23	11
" 11	28	6	26	1	35	2	24	8	26	9
" 18	28	5	26	1	35	5	24	11	24	1
" 25	28	7	26	2	35	6	25	1	26	5
Feb. 1	28	10	26	3	35	0	25	1	24	4
" 8	28	10	26	6	34	3	25	3	24	5
" 15	28	11	26	7	33	1	25	6	24	1
" 22	28	10	26	10	32	6	25	4	24	2
" 29	28	8	26	9	30	11	25	0	24	2
Mar. 7	28	5	26	8	30	5	25	1	23	11
" 14	28	5	26	10	31	3	24	8	24	2
" 21	28	4	26	10	31	7	24	2	26	0
" 28	28	3	26	8	31	4	24	5	23	9
Apl. 4	28	7	26	9	31	3	24	2	24	3
" 11	28	11	26	8	31	2	24	4	23	9
" 18	29	4	26	8	30	11	24	0	23	3
" 25	29	6	26	10	30	10	24	0	23	3
May 2	29	10	27	0	31	6	23	10	23	6
" 9	30	1	27	6	32	4	24	1	24	0
" 16	30	3	28	4	33	1	23	10	24	9
" 23	30	4	29	7	33	8	24	2	24	3
" 30	30	4	31	4	33	5	22	10	24	0
June 6	30	3	32	0	33	1	23	4	24	7
" 13	30	4	31	10	32	7	23	6	24	7
" 20	30	5	31	4	32	0	22	10	24	11
" 27	30	3	31	2	31	5	24	3	24	6
July 4	30	2	31	3	30	11	23	0	24	8
" 11	30	5	32	0	23	8	23	4	24	10
" 18	30	3	32	6	23	2	24	6	20	5
" 25	30	5	32	11	22	4	27	3	20	2
Aug. 1	30	9	33	2	22	1	26	4	19	3
" 8	30	5	33	5	23	0	26	6	21	3
" 15	29	0	33	6	24	2	25	9	17	0
" 22	27	9	33	7	25	0	25	0	16	10
" 29	26	9	33	10	24	3	24	6	16	6
Sept. 5	26	4	31	11	24	9	24	2	16	3
" 12	25	11	31	4	24	3	24	4	16	1
" 19	25	9	31	5	24	3	25	0	16	0
" 26	25	9	31	8	24	8	25	3	16	2
Oct. 3	26	1	32	6	25	0	25	5	16	3
" 10	26	3	33	3	25	3	25	9	16	7
" 17	26	6	34	4	24	10	26	3	16	8
" 24	26	7	35	9	24	10	27	2	16	10
" 31	26	7	36	3	24	8	27	7	16	11
Nov. 7	26	6	35	10	24	8	27	8	17	1
" 14	26	4	35	1	24	4	27	8	17	2
" 21	26	3	34	7	24	1	27	5	17	3
" 28	26	1	34	7	24	1	27	5	17	2
Dec. 5	26	1	34	7	24	1	27	1	17	4
" 12	26	1	34	8	23	11	27	0	17	3
" 19	26	3	34	9	24	3	27	1	17	3
" 26	26	0	34	6	24	1	26	10	17	3

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates : Wheat, 60 lbs.; Barley, 50 lbs.; Oats, 39 lbs. per Imperial Bushel.

AVERAGE PRICES of Wheat, Barley, and Oats per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

	WHEAT.		BARLEY.		OATS.	
	1907.	1908.	1907.	1908.	1907.	1908.
France :	May ...	s. d. 40 3	s. d. 38 8	s. d. 26 6	s. d. 25 11	s. d. 22 9
	June ...	42 6	37 9	26 7	25 6	19 8
Paris :	May ...	41 9	38 5	26 2	26 2	22 11
	June ...	44 5	38 6	27 8	26 2	23 3
Belgium :	March ...	28 10	—	25 7	—	20 6
	April ...	29 4	—	25 6	—	21 7
Germany :	May ...	43 6	46 0	30 11	27 7	25 1
	June ...	44 8	44 8	31 3	26 4	27 0
Berlin :	April ...	41 6	44 8	—	—	25 6
	May ...	43 8	47 3	—	—	22 4
Breslau :	April ...	37 10	42 8	(brewing) 29 0	(brewing) 28 6	{ 23 5 20 1
	May ...	41 6	44 4	{ 24 8 (other) 29 0 (brewing) 26 3 (other) 25 11 (other)	{ 26 5 (other) 28 6 (brewing) 25 11 (other)	{ 25 2 20 9

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets. The mark is now taken as equal to 11·8d., and the German prices for the former year have been recalculated on this basis.

AVERAGE PRICES of British Wheat, Barley, and Oats at certain Markets during the Month of June, 1907 and 1908.

	WHEAT.		BARLEY.		OATS.	
	1907.	1908.	1907.	1908.	1907.	1908.
London...	s. d. 32 1	s. d. 33 0	s. d. 25 5	s. d. 26 8	s. d. 21 4
Norwich	31 6	31 10	24 0	25 7	20 5
Peterborough	31 4	31 1	24 4	24 9	20 6
Lincoln...	31 6	31 9	24 3	24 10	20 7
Doncaster	31 2	31 7	—	24 4	21 6
Salisbury	31 6	32 0	26 0	—	20 4

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of June, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Bristol.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
BUTTER :—	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
British ...	per 12 lb. 12 9	per 12 lb. 11 6	per 12 lb. 13 0	per 12 lb. 11 6	per 12 lb. —	per 12 lb. —	per 12 lb. 14 0	per 12 lb. —
Irish Creamery ...	per cwt. 110 6	per cwt. 108 6	per cwt. 112 6	per cwt. 110 6	per cwt. 107 6	per cwt. 105 6	per cwt. 107 6	per cwt. —
" Factory ...	—	—	102 0	101 6	100 0	92 6	—	—
Danish ...	114 0	111 6	—	—	115 0	112 0	113 0	—
Russian ...	104 0	101 6	107 6	105 0	102 0	99 0	104 0	100 0
Australian ...	106 0	102 0	110 6	102 6	—	—	104 0	—
New Zealand ...	110 6	106 0	112 0	111 0	—	—	—	—
CHEESE :—								
British—								
Cheddar ...	77 6	75 6	74 0	64 0	74 0	70 0	56 6	51 0
Cheshire ...	—	—	—	—	120 lb. 62 6	120 lb. 58 0	—	—
Canadian ...	58 0	56 6	57 0	55 6	55 6	54 0	56 6	56 0
BACON :—								
Irish ...	63 6	58 6	—	—	62 6	56 0	65 6	61 0
Canadian ...	56 0	53 6	55 0	50 0	53 6	49 6	55 0	52 6
HAMS :—								
Cumberland ...	90 0	84 0	—	—	—	—	—	—
Irish	90 0	84 0	—	—	—	—	88 0	79 0
American (long cut) ...	53 6	51 0	53 6	50 0	54 6	50 6	56 0	53 0
Eggs :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British ...	9 7	8 9	8 6	—	9 7	—	—	—
Irish	8 10	8 0	8 0	7 4	7 7	7 0	7 9	6 11
Danish ...	9 1	8 3	—	—	8 1	7 1	8 0	6 10
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Langworthy ...	110 0	100 0	80 0	71 0	101 6	86 6	86 0	81 0
Main Crop ...	110 0	100 0	88 6	71 0	101 6	86 6	—	—
Up-to-Date ...	90 0	82 6	82 6	68 6	71 6	63 6	76 0	71 0
HAY :—								
Clover Meadow ...	87 6	76 6	72 6	—	88 0	64 6	78 0	73 0
	76 0	57 0	65 0	—	—	—	54 6	49 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	JUNE.		6 MONTHS ENDED JUNE.	
	1908.	1907.	1908.	1907.
Swine-Fever :—				
Outbreaks	293	298	1,192	1,343
Swine Slaughtered as diseased or exposed to infection ...	1,889	1,118	6,068	6,245
Anthrax :—				
Outbreaks	94	83	622	608
Animals attacked	111	90	818	809
Foot-and-Mouth Disease :—				
Outbreaks	—	—	3	—
Animals attacked	—	—	112	—
Glanders (including Farcy) :—				
Outbreaks	58	66	407	470
Animals attacked	145	191	1,320	1,146
Sheep-Scab :—				
Outbreaks	4	10	629	400

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	JUNE.		6 MONTHS ENDED JUNE.	
	1908.	1907.	1908.	1907.
Swine-Fever :—				
Outbreaks	17	16	110	63
Swine Slaughtered as diseased or exposed to infection ...	309	121	2,079	1,156
Anthrax :—				
Outbreaks	—	—	4	1
Animals attacked	—	—	7	3
Glanders (including Farcy) :—				
Outbreaks	—	1	—	1
Animals attacked	—	1	—	1
Sheep-Scab :—				
Outbreaks	5	19	266	178

SELECTED CONTENTS OF PERIODICALS.

Bulletin Mensuel de l'Office de Renseignements Agricoles, Mai, 1908.

Notes sur la culture forcée de l'asperge blanche ; Russie.—L'Etat et l'Agriculture, M. Torne.

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Die Blaufaule des Nadelholzes, E. Munch.

Landwirtschaftliches Jahrbuch des Schweiz, 1908. v.

30. Jahresbericht über die Tätigkeit der schweizerischen agrikulturchemischen Anstalt in Zürich pro 1907 ; Untersuchungen über das Auftreten der Weissahrigkeit Weisengrasern in der Umgebung von Landquart, Dr. H. Thomann.

Annual Report of the Bureau of Animal Industry, U.S. Department of Agriculture, 1906.

Report of the Chief of the Bureau, 1905-6, A. D. Melvin ; The Federal meat-inspection service, A. D. Melvin ; The first season's work for the eradication of the cattle-tick, Rice P. Steddom ; The susceptibility of tubercle bacilli to modification, J. R. Mohler and H. J. Washburn ; Epizootic cerebro-spinal meningitis of horses, R. W. Hickman ; Some observations on rabies, E. C. Schroeder ; The prevention of parasitic infection in lambs, B. H. Ransom ; Animal breeding and disease, A. D. Melvin and E. C. Schroeder ; The Danish hog industry, A. Fossum ; Investigations in animal nutrition, H. P. Armsby.

Annual Report of the Secretary for Agriculture, Nova Scotia, 1907.

The Sheep Industry in Canada, J. B. Spencer ; The Sheep Industry in Nova Scotia, M. Cumming.

The Journal of the Department of Agriculture of South Australia, April, 1908.

Egg-laying competition at Roseworthy.

Journal of the Department of Agriculture, Western Australia, April, 1908.

Wheat Selection, E. A. Mann.

ADDITIONS TO THE LIBRARY.

[NOTE.—The receipt of annual publications of foreign agricultural and other departments, experiment stations and societies is not noted in the monthly list of additions to the Library, but a list of all such publications, which are regularly received, will be given from time to time.]

Great Britain—

Banham, G. A.—Table of Veterinary Posology and Therapeutics. (235 pp.) 3rd Edition. London : Baillière, Tindall & Cox, 1908.

Winslow, K.—The Production and Handling of Clean Milk. (207 pp.) London : Baillière, Tindall & Cox, 1908. 10s. 6d. net.

Laveran, A. and Mesnil, F.—Trypanosomes and Trypanosomiases. Translated and enlarged by D. Nabarro. (538 pp.) London : Baillière, Tindall & Cox, 1907.

Garrett, E. W. and H. G.—The Law of Nuisances. 3rd Edition. (712 + 54 pp.) London : Butterworth & Co., 1908.

Memoirs of the Geological Survey. The Geology of the Quantock Hills and of Taunton and Bridgwater. (109 pp.) The Geology of the Country around Oxford. (142 pp.) The Geology of the southern part of the Derbyshire and Nottinghamshire Coalfield. (199 pp.) London : Stanford, 1908. 2s., 2s. 3d. and 3s. respectively.

- Lubbock, Sir John.*—Monograph of the Collembola and Thysanura. (276 pp. + 78 plates.) London : Ray Society, 1873.
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- Robinson, W.*—The Vegetable Garden. (xvii + 782 pp.) London : John Murray, 1905.
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- McConnell, P.*—Soils: Their Nature and Management. (104 pp.) London : Cassell, 1908. 1s. 6d. net.
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- Thomson, A. W.*—Book-keeping and Estate Office Work. (182 pp.) London : Geo. Bell & Sons, 1905. 5s.
- Crooks, Sir Wm.*—The Wheat Problem. 2nd Edition. (207 pp.) London : "Chemical News" Office, 1905. 3s. 6d. net.
- Devine, H. C.*—Peoples Co-operative Banks. (147 pp.) London : Cassell, 1908. 1s. net.
- The London Catalogue of British Plants. 10th Edition. (48 pp.) London : Geo. Bell & Sons, 1908. 9d. net.
- Wallace, Robert.*—Report on Tick, Redwater, or Texas Fever in Cattle. (30 pp.) Edinburgh : Oliver & Boyd, 1908.
- Beckett, E.*—Vegetables for Home Exhibition. (398 pp.) London : Simpkin, Marshall, 1908. 5s.
- Luson, T. and Hyde, R.*—The Diseases of Workmen. (115 pp.) London : Butterworth & Co., 1908. 4s. net.
- Topham, A. E.*—Real Property. (373 pp.) London : Butterworth, 1908. 12s. 6d.
- British Year Book of Agriculture and Agricultural Who's Who, 1908-9. (582 pp.) London : Vinton & Co., 1908. 5s. net.
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- MacDonald, Jas.*—Stephens' Books of the Farm. 5th Edition. Div. II. (261-541 pp. + 11 plates.) London : Wm. Blackwood & Sons, 1908. 10s. 6d.
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- British Museum (Natural History).—A Guide to the Exhibited Series of Insects. (57 pp. + 62 illustrations). London, 1908. 1s.
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Przibram, Dr. H.—Experimental Zoologie. I. Embryogenese. (125 pp. + 16 plates). Leipzig and Vienna : F. Deuticke, 1907.

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Lecomte, A.—Les Associations Agricoles Professionnelles et Mutualistes. (297 pp.) Paris : Laveur. 2 fr.

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Moreau, J. G. and Daverne, J. J.—Manuel Pratique de la Culture Maraichère de Paris : 4^e Edition. (376 pp.) Paris : Maison Rustique.

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Klimmer, Dr. Martin.—Veterinärhygiene. (439 pp.) Berlin : Parey, 1908. 12m.

Kraus, Dr. C.—Die Lagerung der Getreide. (426 pp.) Stuttgart : Ulmer, 1908. 13m.

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- Möller, Dr. A.*—Hausschwammforschungen. 1st Heft. (154 pp. + 5 plates). Jena : Fischer, 1907. 7m. 20.
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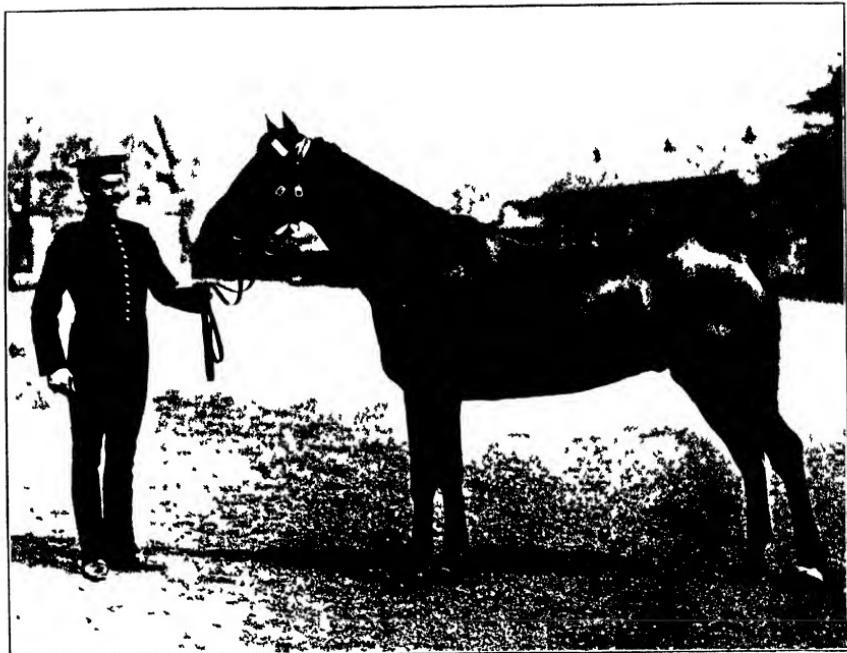


FIG. 1.—HOUSEHOLD CAVALRY.



FIG. 2.—CAVALRY OF THE LINE.

THE JOURNAL OF THE BOARD OF AGRICULTURE.

Vol. XV. No. 5.

AUGUST, 1908.

HORSE-BREEDING SCHEME.

The President of the Board of Agriculture and Fisheries, in the course of a debate in the House of Lords on the 6th of July, 1908, made the following statement on the subject of a scheme for the encouragement of horse-breeding, which has been prepared by the Board in consultation with the War Office :—

EARL CARRINGTON said :

"I will state, as clearly and briefly as I can, the proposals which eventually we mean to bring forward. We are face to face with two things. We have to encourage horse-breeding generally and to secure a reserve supply of horses of a class from which remounts for the Army can be obtained. We have heard this afternoon that the Army buys 2,500 horses annually at five years old ; they pay £40 apiece, making a total of £100,000 a year ; so that the War Office is a very fair customer of the tenant farmers of England and Ireland. Then we are told that 70,000 horses would be required on mobilisation of the expeditionary force, and the total number required to bring the units up to war establishment is 174,000, of which 59,000 would be cavalry horses, a certain number would be artillery horses, and the others would be heavy draught horses necessary for the Army Service Corps and the wagons. This total of 174,000 includes the horses for the Territorial Force, but I do not propose to touch on that question now. The object is to get a scheme for the expeditionary force first, and then, afterwards, in concert with the Lord-Lieutenants and the County Associations, we will endeavour to find a scheme for the Territorial Force. The chief reason for having separate schemes is to avoid overlapping. Your Lordships will learn with satisfaction, on the authority of the Director-General of Remounts,

that the present supply of horses in the country would probably nearly meet the requirements of that Department. The known number of horses in the country is 2,089,000. Those are agricultural and young horses, but that number does not include the horses in the towns.

" Though there is no alarm for the present, the future does cause the War Office no little anxiety. As the noble Earl opposite has said, there were 10,000 fewer foals in 1906 than in 1905, and, therefore, it is the duty of the Government, in the agricultural interest as well as in that of the Army, to take the whole matter in hand. The scheme is practically the registration of a large number of suitable stallions, say 500, and of a large number of suitable mares—we ought, eventually, to have no less than 25,000 brood mares. The registration of their stock would be approved by the military authorities, but no breeding animal would be accepted unless, first, it was passed by a civil veterinary surgeon as sound for breeding purposes, and, secondly, by a remount officer certifying it as suitable for the Army. All registered animals would thus be officially certified as sound. That is, I think, a most important matter, because it would discredit, if it did not altogether knock out, the unsound animals that are now travelling about the country. The ultimate object, and it would not take many years, would be to secure the breeding annually of 15,000 foals of the various classes registered, so that we might be able at a moment's notice to put our hands on the 70,000 horses required in the case of sudden mobilisation. That relates entirely to the First Line, and does not bring in the Territorials at all.

" We propose to give a special fee to the stallion owner, in addition to the covering fee, for every registered mare which is found to be in foal to the registered stallion at the end of the covering season. I know a good many people would sooner see the money go to the mares, but I am not certain that this plan would be the better of the two. If you gave a certain amount to each travelling stallion, at the end of the covering season it would amount to a very considerable sum, and it would make the owners of these stallions missionaries, so to speak, in the movement. When a mare was brought to the horse the owner of the stallion would ask: Is she registered? If she were not registered he would not get the additional fee, and, therefore, he

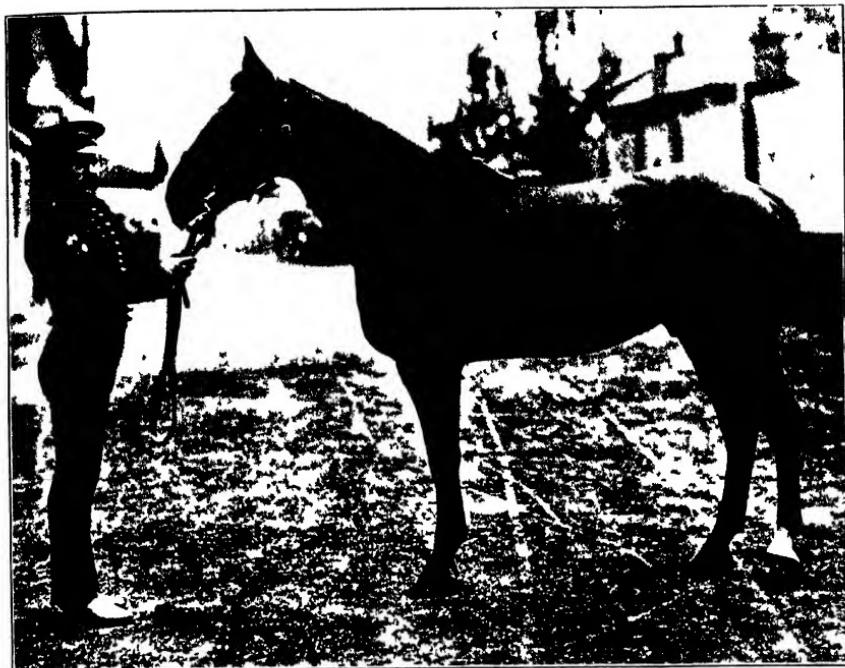


FIG. 3—ROYAL HORSE ARTILLERY



FIG. 4—ROYAL FIELD ARTILLERY

would urge the owner of the mare to get her registered and procure the certificate of soundness. In that way we think we should have 500 travelling missionaries in the country desirous in their own interests of getting the mares registered. It is also proposed to assist the owners of mares in some cases by the payment of the whole or part of the covering fee. This is intended to assist the small farmer, but the payment of such fees on a large scale could not be undertaken.

" Then there is the proposal, which originated and was very much insisted upon two years ago in the speech which the Duke of Portland made on horse breeding in your Lordships' House, of the purchase of three-year-old, instead of five-year-old horses. Your Lordships will see that there is a supplementary report advocating this by Sir Walter Gilbey in the Report of the Royal Commission. The difficulty up to the present time on the side of the War Office has been in looking after these three-year-old horses when they have been obtained. The cavalry commanding officers do not want them in their stables ; they want animals in a hard condition that they can depend on. Then there is the great expense involved if you have *haras* or depôts where the horses are looked after during the two years which are the most dangerous in their existence. The French plan is to buy three-year-olds. The mares are purchased in March or April, and are left with the owner, who feeds and keeps them under inspection and in good condition at light work. But each year a Government stallion is brought into requisition. The foals remain the property of the breeder, and then the mare is taken over by the military authorities in her sixth year, when her second foal is weaned.

" Then comes the question of expense. The establishment expenses are necessarily very heavy. The cost for the five or six-year-old horses that pass into the ranks of the French Army is £70 or £80, as compared with £40 here. Some means must be found, if possible, to carry out this idea in a cheaper way. The proposal is that all the young horses shall be left with their sellers until such time as they are required, a monthly payment being made for their keep for not more than two years. The Army Council would agree to inspect the produce of all breeding stock at three years. This would mean an inspection

of, we hope, from 12,000 to 15,000 young horses annually, so as to keep a lien on the three-year-old horses. Then a report would be made to the Board of Agriculture on the remainder of the 12,000 to 15,000 young horses, which would be placed on the register of young horses. Then we should know pretty well what position we were in.

"It is next proposed that the Board of Agriculture should be assisted in carrying out the scheme by a consultative committee, on which we hope to induce the representatives of the leading societies who have done so much good in the past to give their aid—such societies as the Brood Mare Society and the Hunters' Improvement Society—as well as noble Lords and other persons whose disinterested activity in the cause is a household word.

"There is only one matter I have not dealt with, and that is the question of cost. The noble Earl opposite joined organisation and expenditure together. We can be responsible for the organisation, and, with the help of the advisory committee, we hope we may be able to do something practical. But expenditure comes under an entirely different head. We have worked out satisfactory figures among the departments concerned, and I am glad to say that we have the entire co-operation of my right hon. friend the Secretary of State for War, and of the Army Council. The question of expenditure is now being examined by the Chancellor of the Exchequer, though I need hardly remind your Lordships that the commitments of the Government at present are very large. It would be, however, to the best interests of the nation that the Chancellor of the Exchequer should have all his liabilities and all the requests submitted before he gave any definite pledge, even on such an important subject as this. The scheme will depend entirely for its success on the support given to it by horse-owners and persons interested in horse-breeding. I hope that, though the scheme may not please everyone, it will receive support, for it is by some such method as this that the country can alone hope to deal with the question which has in days gone by been a practical danger, and which is considered to be, in present circumstances, a national disgrace."

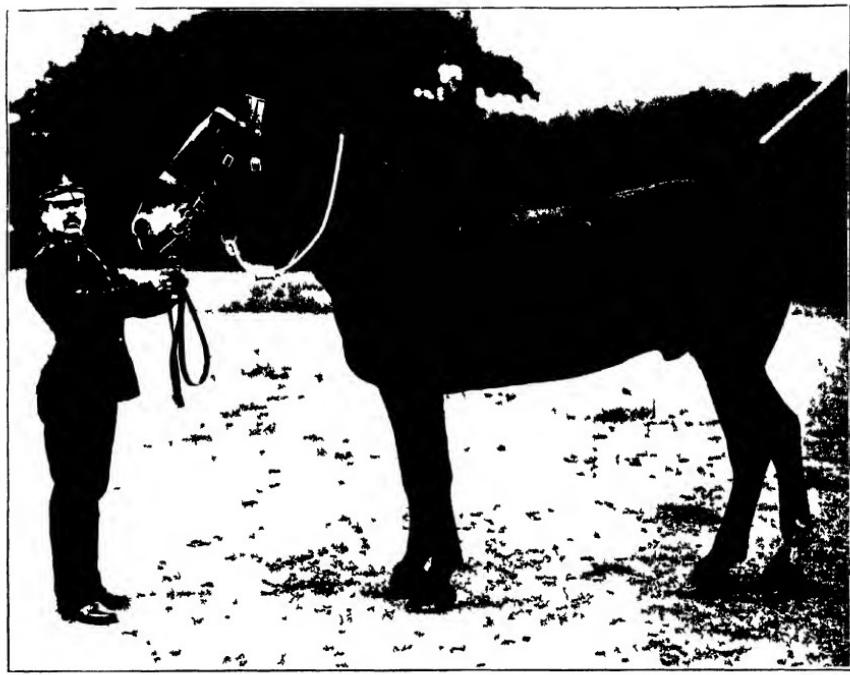


FIG. 5.—ROYAL HORSE ARTILLERY.



FIG. 6.—ROYAL HORSE ARTILLERY.

ARMY REMOUNTS.

The Board of Agriculture and Fisheries have been supplied by the Assistant Director of Remounts, with the consent of the Army Council, with the following information as to the type of horses required for remount purposes in the Army, together with some photographs of typical animals.

Age.—The limits of age for horses entering the Army as remounts in time of peace are between four and seven years, and in time of war from six to twelve years.

Colour.—Whites and greys are only required for special purposes, and are always specially ordered. Other very light, or washy, coloured horses are not accepted.

Soundness.—Entire, unmanageable or vicious horses, crib-biters, windsuckers, parrotmouthed, or undershot horses, or horses with capped elbows, damaged knees, injured or deficient teeth are not admissible.

Horses with short docks are not accepted.

Soundness in eyes, wind, and limb is essential; no animals with worn, upright, or overshot joints, and none with curby hocks are passed.

The above conditions apply to all classes of remounts.

Household Cavalry.—Horses for the Household Regiments must be well-bred and at the same time able to carry weight. Their work being chiefly escort duty in London a certain amount of action is necessary and they must be good-looking animals. The price paid for these horses is considerably higher than that paid for the ordinary trooper.

The colour required is black, and height at four years 15·3 hands, and at five years sixteen hands.

Fig. 1 shows a horse from the Royal Horse Guards. It is found difficult to mount the heavy men of this regiment, but this black gelding (6 years), standing sixteen hands, has plenty of strength and quality for the job, moves well, and is fast.

Cavalry of the Line.—The class required is a deep, short-legged, short-backed, good barrelled horse of the hunter stamp, with substance and quality, true action and going without brushing the joints. Light, active, well-bred horses, that move truly and well in all their paces, well ribbed up, with plenty of bone and short backs, may be said to represent the cavalry type.

Height at 4 years, 15·0½ to 15·2½ hands; over 4 years, 15·1½ to 15·2½ hands.

The number of cavalry horses required annually in normal times of peace is approximately 1,000.

Fig. 2 shows a young chestnut mare (5 years, 15·3 hands) from the 21st Lancers, well-bred, with plenty of bone. This animal is not looking its best in the photograph ; it wants time to furnish, and will look better in another year.

Royal Artillery.—The type required for the Artillery is the weight-carrying hunter, and as every horse, whether in the gun team or not, should be capable of taking its place there on emergency, the same type is preserved right through. For the Royal Horse Artillery, an animal with a little more quality and pace is required than for the Field Artillery.

Height at 4 years, 15·2 to 15·3 hands, and over 4 years, 15·2½ to 16 hands.

Fig. 3 shows a chestnut gelding from the Royal Horse Artillery 15·3½ hands, 9 years old. This is a remarkably good-looking horse, fast, with a lot of quality and great scope.

Fig. 4 is a leader from the Royal Field Artillery, a bay gelding, 15·0½ hands, 13 years old. This horse can gallop, and looks as if he ought to have spent his life as a hunter ; deep through the heart, with short legs, and the best of shoulders.

Fig. 5 shows a centre horse, Royal Field Artillery. This is a short-legged useful horse with good limbs, having plenty of strength. A bay gelding, 15·2 hands, 8 years old.

Fig. 6 is a Royal Field Artillery wheeler, bay mare, 15·2½ hands, 10 years old. This animal shows a nice bit of quality, with a good kind-looking head ; the sort that would get her rider out of a difficulty if she possibly could.

Royal Engineers and Army Service Corps.—Draught horses of the type known as the "Parcel Vanner" are required for these corps. They must be able to trot with a good load behind them, but they do not require so much pace as is needed in the Royal Artillery.

Height, Engineers, 15·2 to 15·3 hands at 4 years, and 15·2½ to 16 hands over 4 years ; for the Army Service Corps, 15·2½ to 15·3 hands at 4 years, and 15·2½ to 15·3½ hands over 4 years. The number of horses required annually in normal times of peace for the Royal Artillery, Royal Engineers, and the Army Service Corps is 1,360.

Fig. 7 shows a draught horse of the Royal Engineers, a bay-

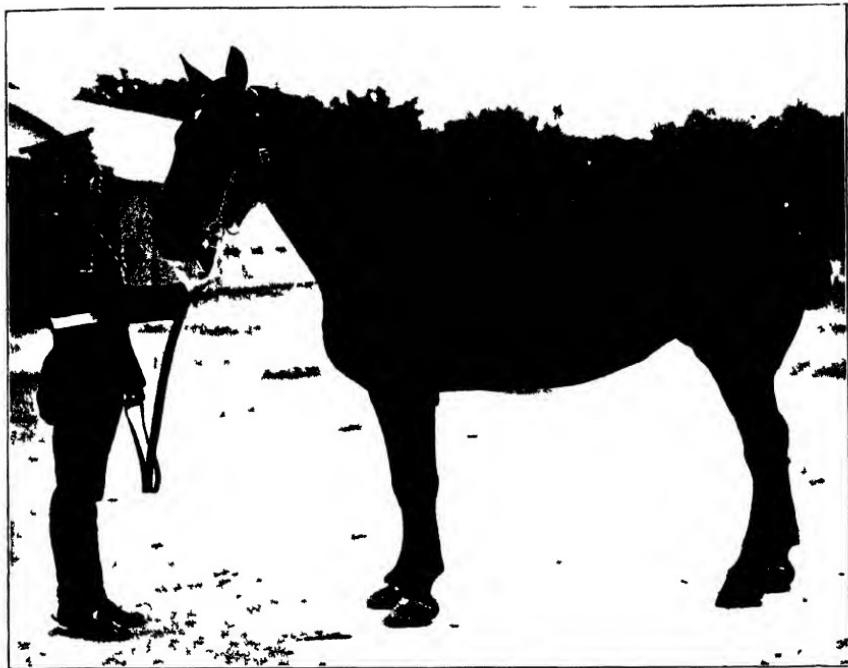


FIG. 7—KAYA INCUBES

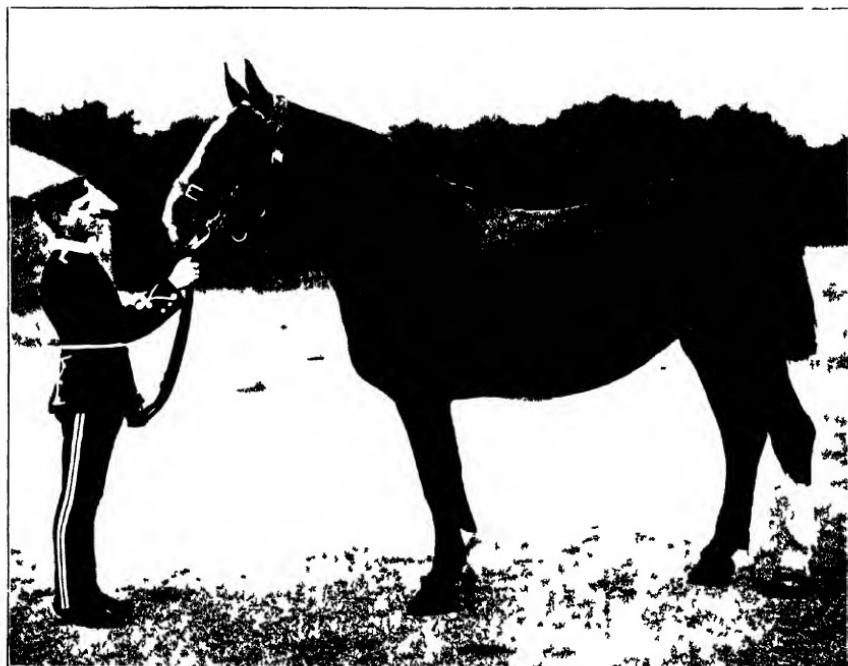


FIG. 8—ARMY SERVICE CORPS

brown mare, 15·0½ hands, 12 years old. This animal is a trifle plain about her quarters, but is a useful sort, with plenty of strength, good shoulders, and limbs.

Fig. 8 represents a good stamp of slow draught horse for the Army Service Corps, a short-legged bay mare, 15·2 hands, 8 years old.

Mounted Infantry.—Mounted Infantry regiments are mounted on animals of the cob or galloway class; they require to be quick and active and able to gallop fast for a short distance. Height, 14·2 to 15·0½ hands, 5 years and over only. The height taken is over the standard for polo, so that there are plenty of animals of the stamp and quality required.

The number of horses required annually in peace for the Mounted Infantry is 140.

Fig. 9 shows a Mounted Infantry cob, 14·2½ hands, 12 years old. This animal has a nice short back and an intelligent head well put on, and looks wonderfully fresh on his legs considering he has been in hard work for 7 years without a day's rest.

Fig. 10 shows another Mounted Infantry cob, 14·1½ hands, 9 years old, which has done a great deal of work and is capable of doing a great deal more.

There are no specified dates for the assembly and inspecting of horses. The Inspecting Officer of the Remount Staff is the final authority to decide on the purchase or rejection of any animal.

SMALL HOLDINGS IN HEREFORDSHIRE.

JOHN O. PEET, B.Sc.

County Instructor in Agriculture for Hereford.

Though small holdings in Herefordshire are not so numerous as they are in many districts, their total number is much greater than most people well acquainted with the country are aware. The returns issued by the Board of Agriculture in 1907, show that out of a total of 5,117 holdings over 5 acres in the country, 2,761 do not exceed 50 acres, and there are in addition 1,361 holdings between 1 and 5 acres.

Soil and Climate.—The soil throughout the greater portion of the county is derived from the Old Red Sandstone formation,

and varies from light land in the south, well suited for corn and sheep or for potato culture, to a strong loam or a moderately stiff clay elsewhere. Both soil and climate appear to be specially favourable for the apple crop. Apples grown in the county develop a finer colour than is attainable in many localities, and growers meet with a considerable amount of success at important shows all over the country.

Markets.—There are no large towns and the total urban population at the last census amounted to only 37,377, so that, in the event of any considerable increase in the produce of small holdings, a market for it will have to be found outside the county. A good fruit market established by the Corporation is held weekly at Hereford during the season, and is well attended by buyers from South Wales. The Hereford Co-operative Fruit Grading Society, started three years ago by the Herefordshire Fruit Growers' Association, deals with a considerable amount of fruit, and the committee are now considering the desirability of adding the collection and grading of eggs to the useful work they are already doing. A very successful egg-collecting society, working on co-operative principles, has been in operation for some time in the Eardesland district. There is good railway communication with London, Bristol, South Wales, Birmingham, and the North, so that the county is favourably situated for sending produce by rail, and no difficulty is experienced in getting it to the markets in the large centres of population. Large quantities of strawberries and other fruit are sent away regularly during the season.

Hereford, Ross, and the Wye Valley generally, Colwall, and other places attract large numbers of visitors during the summer and are apparently increasing in popularity as holiday resorts, and visitors occasionally, after returning to their homes, have their supplies of butter, eggs, poultry, and fruit forwarded regularly from a farm in the district where they spent their holiday. The railway companies now afford special facilities for this class of trade, forwarding the goods, collecting the cash in payment for them, and generally acting as the seller's agent. This is a method of marketing particularly suited to the small holder, and is capable of considerable extension in districts frequented by holiday visitors. There are no middlemen's

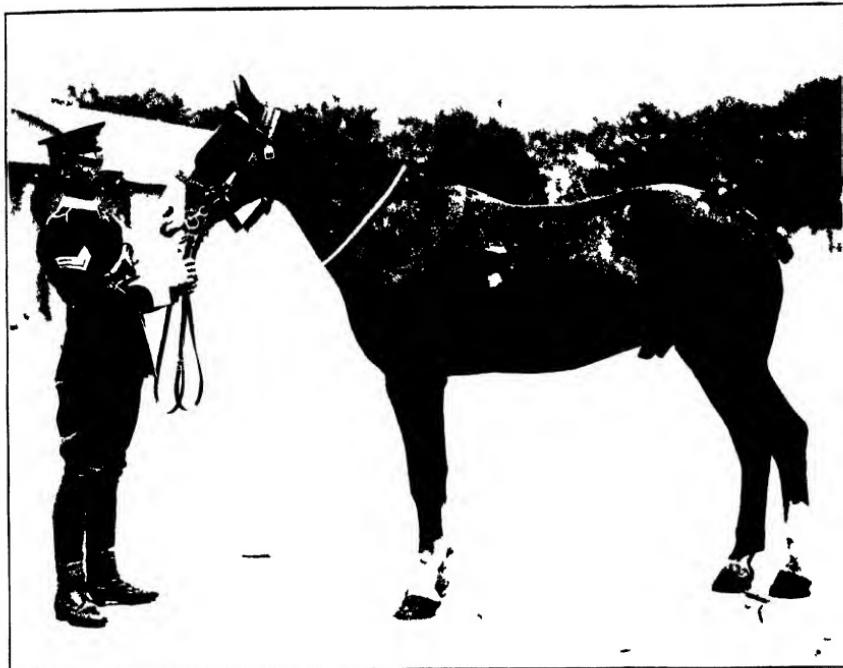


FIG. 9—MOUNTED INFANTRY



FIG. 10—MOUNTED INFANTRY

profits to provide, and the dweller in town is often willing to pay a little more for supplies direct from the country if he can depend upon their quality and absolute freshness.

Small Grass Holdings.—The most numerously represented class of small holding is that consisting entirely, or almost entirely, of grass land. These grass holdings are generally from 5 to 15 acres. They are occupied, as a rule, by a superior and thrifty class of farm labourers, either farmers' sons who lack the necessary capital to enter upon a larger farm or the better and more skilful labourers, who have saved sufficient to stock a holding of this kind. The men are engaged on the neighbouring farms, usually as regular labourers, and it is generally acknowledged that they make the best and most trustworthy hands. Their holdings are stocked with a cow or two, a few head of young stock, sheep and poultry. The work, apart from what the husband can accomplish in his spare time, is done by the wife ; it consists chiefly in the management of the little dairy and the poultry stock, and the marketing of the produce. A large number of poultry is usually kept, and eggs have been remarkably cheap in the past, 20 for 1s. being quite a common price during the plentiful season of the year. During the last two years, however, better prices have been realised, owing to more buyers collecting them to send away and to the great extension of the practice of preserving eggs when they are fairly cheap, for use in the winter.

Small Mixed Holdings.—Small mixed holdings with a fair proportion of both arable and grass land, are found in many districts, managed, as regards cropping and stock, in much the same way as the larger farms. The occupiers, however, even of those consisting of only a few acres, are precluded from taking regular employment elsewhere by the amount of work required on their own arable land, and the occasions when extra labour is most in demand on the neighbouring farms are just those when their own crops require attention most urgently. Only a very small amount of arable land can be managed satisfactorily by a man following other employment. Some of these small occupiers undertake special work, such as hedging, butchering, &c., in the winter, or sheep-shearing in the spring, and apparently do well. On holdings of 40 acres or more, the tenant is often seriously handicapped in regard to

implements. From the condition of these small mixed holdings and the history of their occupiers in the past, they are not, so far as can be judged, a success on the whole, unless the holder goes in for some special branch of farming, such as fruit culture, strawberry growing, or cider-making. The last of these is an important industry in the county, well suited to small holders, many of whom have taken it up successfully.

Fruit Cultivation.—Holdings devoted mainly to fruit culture are not nearly so numerous as grass or general mixed holdings. The soil and climate, however, are acknowledged to be specially favourable for fruit, and its cultivation is increasing. Old grass orchards of standard apple trees, mainly cider varieties, are numerous and have existed here for ages. The production of cider fruit is likely to receive more attention in the near future than it has in the past, for while the trade in cider has developed considerably the orchards have degenerated, and little planting of cider varieties has been done. A good many large fruit plantations have been established during recent years, and small holders have now gone in for fruit culture to some extent.

For fruit culture there is in the county plenty of land as suitable as any to be found in districts where the industry has been long established, and it is let at a lower rental—the average being about £1 10s. to £1 15s. per acre. The principal disadvantages connected with this class of small holding are the large amount of capital required per acre, the time taken for the trees to come into full bearing, and the uncertainty of the crop, owing to late frosts and other unfavourable conditions of weather. Tenants possessed of the necessary technical training and the landlord's permission to plant, may get over the need of a large capital at the commencement by planting a small portion of land each season and raising the trees themselves, a system which has been adopted in establishing most of the existing plantations, and also by underplanting with small fruit which soon comes into bearing, such as gooseberries, currants, or strawberries. The difficulty arising from the uncertainty of the fruit crop is overcome by planting several kinds of fruit and a few varieties of each, including both early and late ones. It is rarely that more than one or two kinds of fruit fail to produce a crop, or that both early and late varieties

are seriously affected by spring frosts, so that by adopting this method the grower is fairly certain of an income from some portion of his plantation.

The cost of stocking land with bush apples planted 15 ft. apart is about £10 an acre, including cultivation, purchase of trees and planting, and for gooseberries or currants planted between the rows at 5 ft. apart £21, making a total of £31 per acre.

Market Gardening.—There is practically no market gardening carried on in the county, beyond that on allotments in the neighbourhood of the towns, and a little potato growing in the south, though there is plenty of land suited for it.

Prospects for Holders.—The agricultural conditions of the county, and especially of the small holdings, suggest that there is a fair prospect of success for an increased number of small grass holdings occupied by farm labourers or others with regular employment or with skilled occasional occupation, and also for holdings devoted mainly to fruit culture, provided the tenants have a sound practical knowledge of the work and sufficient capital for the proper stocking and management of the acreage they undertake.

ACTINOMYCOSIS.

This disease is met with in most parts of Great Britain under such local names as wooden tongue, wens, lumpy jaw, big head, &c. In this country cattle are principally attacked, but it may also occur in pigs, sheep, horses and man.

Actinomycosis runs a chronic course and is characterised by the formation of tumours in various parts of the animal body. These tumours interfere with the functions of the organs in which they are situated and usually burst or ulcerate. If untreated the animal steadily wastes, especially if the tongue is affected, and it eventually dies.

Cause.—The disease is caused by the entrance into the animal and the propagation in its tissues of the actinomycetes. This is a fungus which grows on grasses and most cereals, particularly on barley. It flourishes luxuriantly on damp-rich soils. Injuries to the skin and to the mucous membranes

of the mouth and tongue, caused by hard straws or barley awns, as well as the teething troubles of young animals, predispose cattle to this disease by favouring the entrance of the actinomyces to the tissues.

Symptoms.—The disease is usually local, that is, it is confined to one organ of the body, and the symptoms are largely determined by the part attacked. Nodules of varying sizes often form on the skin of the head and neck, at times these are firm to the touch, while sometimes the skin is broken and the nodules are granular, soft, yellowish in colour, and covered by a crust. The skin covering the lips, being very liable to injury, is frequently attacked. The lips then become hard and enlarged to such an extent that food is gathered with difficulty.

The tongue, however, is the commonest seat of the disease. The presence of the actinomyces in this organ excites a growth of fibrous tissues, causing the tongue to become hard and immobile, hence the name "wooden tongue."

This gives rise to a constant dribbling of saliva and quidding of the food, which causes the mouth to be examined. The hardness and painfulness of the tongue and the presence of ulcers at its base, render this form of the disease easy of diagnosis.

At times tumours can be felt under the skins in the muscles of the cheeks. Both jaw bones, but usually the lower one, may be invaded by the actinomyces from the soft tissues of the mouth and possibly through the sockets of the teeth. Great swelling of the attacked bone is noticed, and the head sometimes swells to a great size. Pus collects in cavities in the bone, eventually breaking through the skin, and forms wounds which constantly discharge.

In this condition the jaw is easily fractured and the teeth drop out.

A very common form is met with when the glands of the neck are affected—a swelling or "wen" appears between the angles of the jaw, which steadily increases in size until breathing and swallowing are interfered with. These tumours often burst and discharge a characteristic, granular, yellow pus.

The presence of tumours (*polypi*) attached to the mucous membrane of the mouth and the back of the throat can

often be recognised by the snoring grunt which accompanies breathing, and by the difficulty in swallowing.

Actinomycosis also occurs in the udder, and in the spermatic cord of castrated animals, giving rise to fibrous enlargement of the said organs.

Treatment.—In districts where the actinomyces flourishes it is almost impossible to prevent animals being attacked. Drainage of land is said to have diminished the numbers of cases by checking the growth of the fungus. If barley straw must be fed to stock, it should not be fed to young animals when changing their teeth, as the actinomyces has an excellent chance of entering the tissues through the gums.

Although prevention is difficult, the disease responds to treatment. Whenever possible, the actinomycotic tumours should be removed by a veterinary surgeon. When in an inseparable position, medicinal treatment will generally check or cure the disease. Treatment should not be attempted by a layman, as the tumours have usually to be removed from the region of the head and throat, which only a skilled surgeon may attempt, while the success of the medicinal treatment depends on giving the specific drug until symptoms of poisoning by this drug appear, when its administration must immediately be stopped.

The Board recently made some inquiries into the occurrence and prevalence of actinomycosis in Norfolk, and a note on the subject appeared in the *Journal* for November, 1907, p. 490.

SWINE-FEVER.*

Swine-fever is a contagious and eruptive fever peculiar to swine and due to a filterable virus. By the term filterable is meant that the virus is so minute that it can pass through the pores of the closest porcelain filters. If, for example, a fluid containing the virus of swine-fever is mixed with one containing anthrax bacilli, and passed through a bacterial filter, the filtrate would contain no anthrax bacilli and would be incapable of giving anthrax

* This article will be issued as Leaflet No. 29, copies of which can be obtained on application at the Offices of the Board.

to the pig when inoculated, but it would still cause swine-fever by inoculation, because the virus of that disease is not retained in the pores of the filter. The swine-fever microbe, unlike the anthrax bacillus, is too small to be seen by the highest powers of the microscope, and for this reason it may also be described as an ultra-microscopic virus. That there is a specific and infective agent, however, is not open to doubt, notwithstanding the fact that it cannot be seen, for swine-fever can certainly be produced in susceptible pigs by inoculating them with the filtered or unfiltered blood of diseased pigs.

Incubation Period.—The incubation period, that is to say, the time which elapses between contact with infective material and the appearance of the first symptoms, is about five days. It is not to be concluded, however, that very distinct symptoms will always be noticed at such an early date. The first sign of infection is usually little more than a rise of temperature, which can only be ascertained by using a thermometer. In most outbreaks, the distinct signs of illness do not appear for eight or ten days, or even more, and this has led to mistaken views being held on the length of the incubative period. In some outbreaks, however, the virus is so potent that the distinct symptoms may appear much earlier, and the swine attacked may be dead in less than ten days.

Symptoms.—For the information of the pig owner, it will be useful to describe the symptoms as much in relation to an outbreak as to the individual pig. Young swine are, as a general rule, more severely attacked than others. It seems probable that the virus of swine-fever possesses varying grades of virulence, and that in consequence, the severity of outbreaks differs. As seen in this country, the outbreaks of swine-fever might be referred to three principal classes, which tend to approach each other as the surrounding circumstances alter.

i. There may be a very virulent outbreak which is characterised at the start by a very short period of illness and a large number of deaths at one time or at short intervals. In such cases the temperature of the sick animal rises to $106^{\circ}-7^{\circ}$ F. The affected animals refuse food, and bury themselves in the dry litter, or, if no litter is available, they

may lie up in the most isolated corners of the sty. There may or may not be a purple rash on the skin of the ears, belly and hocks, but usually there is not. Diarrhoea is generally observed. The patients become more and more comatosed (unconscious), and they die in about a week after infection, that is to say, after two or three days' illness. Outbreaks of this kind are sometimes ascribed to poisoning or other causes at the start, but swine-fever should always be suspected under the above circumstances when no definite knowledge of poisoning or other cause for the mortality is actually to hand. Usually, though not always, the virulence of this class of outbreak tones down shortly after the first onset, and a condition of affairs like the second class establishes itself; but not infrequently all the pigs of a fairly large establishment—100 or more animals—may die off in a few weeks.

2. Outbreaks of medium virulence may also occur, and in such cases the disease runs a more chronic course, and the symptoms are of a less toxic nature. One or two animals die after a longer but less striking illness, and further deaths continue to take place at varying intervals. The number of animals found to be ill at one time varies according to the facilities for direct and indirect contact in the particular establishment concerned. In this class of outbreak death may occur in from ten days to three weeks after infection, but many of the affected animals may recover after a convalescence of varying duration. The symptoms begin by a rise of temperature to $105^{\circ}-6^{\circ}$ F. The swine go off their food, suffer from continuous diarrhoea, and become very much emaciated. They bury themselves in the litter, and can only be made to move out with difficulty. When made to move, they do so with an unsteady gait, and often show signs of pain in their joints. A noticeable symptom is great thirst, and affected animals may often be seen and heard sucking up the drainage from the floor of a wet sty. They may or may not show a purple rash on the skin of the ears, belly and hocks, and it may here be remarked that although a purple rash in ailing pigs should always arouse suspicion of swine-fever, it is far from being a constant symptom. This kind of outbreak may ultimately assume the characters of the third class.

3. In the third class of outbreak the symptoms, as a rule, are not marked. One or two deaths may occur, but frequently the only indication that anything is amiss is an appearance of unthriftiness in a number of the pigs. The absence of deaths often misleads the owner regarding the real cause of the trouble, and it cannot be too strongly insisted that general unthriftiness in a number of pigs should excite suspicion, at least, of swine-fever. It has been mentioned that the outbreak of medium severity may ultimately assume the characters of the class under description, but many outbreaks exhibit those of the third class from the beginning. Sometimes the owner's attention is only first seriously aroused by a high mortality taking place among his young pigs, particularly amongst those which have just been weaned. Such a mortality should immediately arouse suspicion, and advice should be sought from the authorities in accordance with the Swine-Fever Order. It is quite common for owners to assert that their young pigs have been overlaid, when in reality they have died of swine-fever. This is the class of outbreak most difficult to deal with, since it is the hardest to locate, and frequently the pigs from the premises are sent to markets, or sold directly to other owners, in the belief that, even if they are a little unthrifty, they are none the less free from swine-fever. The affected pigs which come in this class are usually the older ones, and they may even appear quite fat and healthy looking. Pigs aged three and four months, however, may also be concerned, though usually this class of animal shows distinct signs of unthriftiness and frequently pain in the joints. In the older and apparently healthy animals a death may take place quite suddenly owing to some complication, and the owner may be misled into believing that his animal has died of poisoning, errors in feeding, or some other cause about which he has no definite information.

In all classes of outbreaks the true nature of the trouble may be masked by symptoms of pneumonia (inflammation of the lungs); some of the most fatal outbreaks are ushered in by an acute and fatal form of pneumonia. A number of deaths from pneumonia should always arouse suspicion, and lead to advice being sought. From what has been said above,

it will be seen that the death-rate from swine-fever varies in different outbreaks. From inquiries conducted by the Board during 1907 it would appear that, taking one outbreak with another, the average death-rate is about 30 per cent. There is no other disease of swine in Great Britain which, as a general rule, gives rise to continued unthriftiness, and none, with the exception of swine erysipelas and pneumonia, is likely to cause such a high mortality. The experience of the Board, however, over a number of years shows that when outbreaks of the two latter diseases are reported, the trouble not infrequently turns out to be swine-fever.

To sum up shortly, pig owners may reasonably be expected to report under the following circumstances : (1) When a number of animals are dying ; (2) when a number of animals are sick or unthrifty ; (3) when periodic deaths are taking place, even if the other pigs appear healthy ; (4) when a high mortality is noticed in sucking or newly weaned pigs, even if the older ones appear to be healthy ; (5) when a number of pigs are sick or dying with symptoms of pneumonia, diarrhoea, or what may appear to be acute swine erysipelas. The fact of the suspicious symptoms appearing first in pigs which have been recently purchased, or in a sow which has been to the boar, in pigs recently cut, or in those which have been off the premises to a market, and have been brought back, should always increase the suspicion, but careful inquiry into the circumstances in connection with a considerable number of outbreaks shows that the fact of no new pigs having been brought on to the premises for some months does not of itself justify a definite conclusion that an outbreak of disease is not swine-fever.

Post-Mortem Appearances.—The carcases of pigs which have died of swine-fever may or may not be emaciated, and purple patches may be present on the skin of the ears, belly and hocks. In the acute cases characterised by death after a short period of illness, redness of the lymphatic glands is observed, there are signs of inflammation on the mucous membrane of the intestines, while the membrane is often dotted over with innumerable red blood spots. These small haemorrhages, however, are not peculiar to the very acute forms, and they may also be seen in the more chronic cases. In the more chronic forms one finds a diphtheritic deposit in the form of a yellowish

membrane on the inner surface of the intestines. The most typical lesion is the swine-fever ulcer, which is most commonly found in the large bowel about the junction of the ileum and cæcum, but swine-fever ulcers may also be found much more rarely in the throat, on the tongue, and on the skin. In examining the intestines of sick animals which have been killed for purposes of diagnosis, it must be borne in mind that it does not follow that the disease is not swine-fever because the more typical lesions of ulceration and diphtheritic deposit are not found. The experimental inquiries conducted by the Board have shown that many animals may have a slight attack of swine-fever and recover in a little more than ten days. If cases of this description be examined in the febrile stage, nothing more may be found in the bowel than slight redness or abrasions on the folds of the mucous membrane. The most common form of ulcer is about the size of a threepenny piece. Its edges are circular, and raised above the membrane. Its centre is soft and either yellow or black in colour. Congestion of the mucous membrane of the bowel should always be looked upon with suspicion, and particularly if it is combined with inflammatory lesions in the lungs.

Virulent Material and Spread of Infection.—It may be said that the blood of pigs affected with swine-fever contains the virus of the disease, since it has been proved to be capable of infecting healthy pigs when injected under the skin. Since the blood flows through all the organs during life they must all be held to possess some degree of virulence. The intestines containing lesions are particularly virulent, and it has been shown repeatedly that swine-fever can be produced in healthy pigs with great certainty by feeding them on diseased intestines. The fæces of affected swine are also virulent. In practice the disease is spread mainly by the excretions from the bowels of affected pigs. It is highly probable that infected fæces are frequently carried from infected sties or premises to clean ones on the boots or clothes of attendants or castrators.

Prevention.—It may be stated at the outset that the more sanitary the condition of the premises, the less difficult it will be to prevent swine-fever, once it is introduced, from spreading all through the sties; but for those who are compelled to

buy pigs in the markets, or are dependent in any way on other people for their supplies, it cannot be claimed that the possession of sanitary premises is any safeguard against the introduction of the disease. After what has been stated above in relation to the virulent material and the spread of disease, it should not be necessary to do more than shortly summarize the observances for precaution as follows :—

1. Pigs which have been recently purchased, or which have been off the premises to a market and brought back again, should be kept isolated from the others for about a month, and carefully watched ; the same rule applies to sows which have been to the boar and to pigs which have recently been cut by a practising castrator.

2. Sows which have survived an outbreak, that is to say those which in all likelihood have suffered from swine-fever and recovered, should not be bred from, as there is a considerable amount of circumstantial evidence to show that they possibly infect their young.

3. In the event of swine-fever, or suspicious symptoms appearing in any part of the premises, the pigs therein should, if possible, be kept rigidly isolated from the others, and have separate attendants, who should wear special boots and overalls in and about the sties. The experimental inquiries conducted by the Board show that sick and healthy pigs can be kept in close proximity without the latter becoming infected, if the sties are completely separated from each other, and the attendance is performed by separate persons. It is true, of course, that under such conditions it will be difficult at any time safely to assert that the pigs in the other sties are not sickening for swine-fever, and that they can be sent to market without risk, but inasmuch as it is advisable on infected premises to stop breeding, and fatten off all pigs for slaughter before restocking, it will greatly tend to lessen the losses while this is in progress, if proper measures for internal isolation are taken.

4. Once an infected sty has been cleared of its occupants, it should be thoroughly disinfected and left empty for about three weeks.

5. If there are rats on the premises, an effort should be made to reduce their numbers by the use of one of the viruses which are harmless to pigs. This is advisable, not because

rats suffer from swine-fever, but because it is possible that they may convey infected material from one sty to another.

6. When affected pigs have been the subject of post-mortem examination, care should be taken that no material from the carcase comes in contact with healthy swine, and all assistants at the operation should properly disinfect themselves.

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THE BREEDING AND REARING OF TURKEYS.

J. W. HURST.

Until comparatively recent years English turkey-raising for market was practically confined to the eastern counties, the greater proportion being marketed from Norfolk and Cambridge. Latterly, however, breeding has become more extended, and outside competition has considerably increased. On the other hand, the demand has also increased, and there has been a noteworthy lengthening of the season. Turkeys may now be said to be in season from November to April, and turkey poult from about July to October. The special demand for large birds is chiefly limited to the periods immediately before and after Christmas, when the value is dominated by weight, and the price per lb. rises with increasing heaviness; but birds of medium weight meet the requirements of the majority of consumers at other periods, and hens of from 10 lb. to 14 lb. are in increasing demand. As regards the provincial markets, much valuable information regarding the periods of demand and weights required will be found in articles on the "Marketing of Poultry," which appeared in this *Journal* in February and May, 1908.

There is no class of producer so favourably placed for the breeding and rearing of turkeys as the farmer, indeed it is scarcely possible for others to undertake their production successfully, for without his opportunities of space and facilities for feeding it is difficult to produce healthy stock profitably. Turkeys require an ample range and home-grown food, without which the cost of keeping them becomes excessive on account of the length of time between hatching and marketing.

Suitable Situations.—Although turkeys may be raised on heavy land the operation is difficult, particularly in a wet season, and as a rule they do better on light soils, except in very dry weather, when there may be some deficiency in the green food. The best results will be obtained upon a rich soil, which is not absolutely heavy in character. Upon some farms there is a certain latitude in this particular, in which case the pasture must be selected for rearing according to the prevailing conditions of the season, preference being given to a dry and sheltered position, facing south if possible and protected from cold winds.

As young birds will not thrive in a cold bleak position, every advantage must be taken of banks, or hedges, which will serve as wind breaks, and if these are not available, wattle and faggot screens may be temporarily erected to the windward of the coops. In the latter case the trouble involved is worth while, as it enables the rearing to be conducted under healthier conditions than where recourse is had to sheds and buildings; a reasonable open air method of rearing being essential to health and soundness of constitution.

Varieties.—The American Bronze most nearly resembles its wild progenitor, and good strains attain an average weight of about 30 lb. in the cock birds and 16 lb. in the hens. In appearance this breed is very handsome, the neck, breast and back being black, shaded with a glistening bronze. The under parts are less richly coloured. The wings are black, barred white or grey and edged with white; the wing bow having a greenish or brownish lustre. The tail is black with brown pencilling, and the coverts grey, shading into black and ending in a brown band. The face, ear lobes and wattles are a rich red, and the legs long and dark in colour.

The old English local varieties of the eastern counties have been known as the Norfolk Black and the Cambridge Bronze—the result of crossing. The plumage of the former is black, with more or less white spots, and that of the latter a bronze grey, although there is a considerable variation in different strains, and the types are not generally maintained nowadays.

In addition to the foregoing the white turkey is now much more commonly seen than was the case a few years ago,

breeders having to some extent overcome the popular prejudice based upon the supposition that whiteness of plumage is necessarily synonymous with delicateness of constitution. The appearance of the white birds is very attractive on account of the contrast afforded by the red and blue hues of head and neck and the black tuft of the male upon the white plumage of the breast. White turkeys are as a rule fine in bone and of a delicate flavour, but they are also relatively small in size. A very useful cross may, however, be made by running a bronze male of medium size with white hens. The young birds are curiously speckled in appearance, but have been found hardy, and comparatively easy to rear, attaining a useful marketable size if exceptional weight is not required.

Housing.—The natural instinct of adult turkeys is to roost in trees, but this is inadmissible in a country more or less overrun with foxes. Delicateness and disease, however, are the direct result of badly ventilated or overheated sleeping quarters, and a special form of house is necessary for their proper accommodation. Although some special features are essential the construction of a suitable house is really very simple. In common with all forms of fowl houses the floor must be dry and the erection generally draught and rainproof. The roof should, if possible, be thatched. The arrangement of the perches is important; they should be broad, but not too broad for the birds to grip, and must run from end to end of the building, each perch being about 2 ft. higher than the one below and 2 ft. farther back, so that the birds cannot roost one over another.

Turkeys always prefer to remain on their perches until let out in the morning, when it is their habit to fly straight out and alight on the ground at some distance in front of the house. For this reason, and to prevent the birds damaging themselves, the whole of the front of the house must be made to open in the manner of folding doors. These doors should consist of strong frames, hung on hinges and covered with wire netting. It is only from stock housed in a healthy open-air manner that a healthy progeny can be expected.

The Breeding Stock.—Many of the failures in the past have been primarily due to in-breeding, and the use of immature stock wanting in stamina. The use of well-bred and well-

grown stags for mating is of the first importance and the evils of close-breeding are quickly apparent. Well-grown birds for breeding are not necessarily of great size. An approximation to 20 lb. in the males and 15 lb. in the females would be suitable weights for ordinary breeding purposes, other considerations including width of shoulders, contour of breast and a medium length of leg. The stock birds should preferably be from two to three years old, and from six to eight hens may be run with a vigorous cock, although a more usual proportion is four or five hens. It must be added in this connection that one service is usually sufficient for the fertilization of a batch of eggs, but permanent mating is preferable. During March the hens require watching or they will choose some out of the way spot in which to lay. April is the best hatching month, and it is generally considered inadvisable to continue incubating operations beyond June, but although late hatched birds have insufficient time for full maturity they may be disposed of as pouls if bred from birds in good breeding condition. Turkey hens are usually good mothers, but their eggs may also be hatched under ordinary hens or in incubators. A turkey hen will cover from fifteen to sixteen eggs or a large barndoer hen may be given from eight to ten, and the period of incubation is twenty-eight days. The nests should be upon an earth bottom, and the general management during incubation is similar to that of ordinary hen's eggs.

The correct feeding of the stock birds has an important bearing upon the ultimate success. If the food is too fattening the stag will fail to fertilize the eggs and the hens will be liable to egg-binding by broken shell-less eggs in the oviduct. The dietary must necessarily vary according to the weather and conditions, but may include ground oats, barley meal used in moderation, biscuit meal, middlings and greaves—with grain at night. Some breeders prefer a whole grain diet for both morning and evening feeding, using wheat, barley and oats (a greater proportion of the latter), together with cabbage and such roots as swedes, when the pasture is poor, but considerable variation is possible and necessary, according to the character and condition of the range. It is almost unnecessary to insist upon the importance of a generous supply of grit and calcareous material.

Rearing.—The principle of the roost house should as far as possible be applied to the coops, the doors of which should be wire netted and covered with sacking in severe weather if necessary. The birds should be cooped with their natural or foster mothers upon short turf in a dry sheltered position with a sunward aspect. The coops must be moved a short distance daily to a fresh patch, and the hens allowed out with the young birds when possible.

A suitable food for the young birds is steamed rice and biscuit meal, dried with fine sharps, or as an alternative some rearers start their birds with curds and fine oatmeal. They may, however, be reared from the shell upon Sussex ground oats in the same manner as chickens are in the south-east, and with equal success. With any soft food an admixture of finely chopped dandelion leaves is especially beneficial—the whole being sprinkled with fine sharp grit. The feeding must be commenced early and continued until late in the day, not much food is required at one time but it is necessary to give it at frequent intervals, commencing with six meals daily.

At about the third week the diet may be changed to include most of the foodstuffs given to ordinary chickens, but during the period between chickenhood and fattening some of the best results are obtained from an almost entire use of Sussex ground oats, using a sufficient proportion of sharps to facilitate mixing. Boiled wheat is also a useful food during the early days, although it is too expensive a diet for any but the grower to adopt to any extent, and later on the new corn is helpful, the birds being subsequently run upon the stubbles. Turkey chicks must at all times be comfortably cooped or housed at night, and it is important to keep them dry during their early days.

Fattening.—The selection and separation for stock purposes should be made in the autumn, reserving for that purpose birds of good frame and stout legs rather than purely heavy specimens. Those carrying much flesh are generally possessed of small bones and are consequently more suitable for fattening than for stock ; they should not, however, be shut up until some time in November, but allowed the run of the meadows, being at the same time well fed on ground oats. The birds that have been kept in good condition all along will be those

to respond most satisfactorily to the fattening process proper.

About a month before they will be required for killing they should be confined in a large open-fronted shed, situated in a quiet position. The best fattening food is Sussex ground oats and milk, with fat added every other day, but barley meal and maize meal is often added in equal proportions. Swedes or potatoes may also be boiled and mixed with the meal. Mix all the food soft but not sticky, and feed it in a trough which must be kept well scoured, and supply plenty of grit. If desirable cramming may be resorted to during the latter portion of the period, but if the birds were in good condition at the commencement of trough feeding it should be unnecessary in most cases.

Marketing.—Kill by dislocation of the neck and pluck warm, drawing the feathers in their own direction, plucking the bird clean except for the tail and outer wing feathers, which it is usual to leave on. General details regarding shaping, tying and packing will be found in the *Journal* of February, 1908, under the heading “The Marketing of Poultry.”

FOWL CHOLERA.*

Fowl cholera is a highly infectious disease, which, though comparatively rare in this country, has caused serious loss to poultry keepers on the Continent of Europe, in North America and in South Africa. It frequently assumes an epidemic form, and in such cases often more than half the stock have succumbed. The disease affects not only fowls, as its name implies, but also geese, ducks, pigeons, pheasants, and some wild birds, such as sparrows and finches. Rabbits can be inoculated with the disease, but the larger domestic animals are not susceptible to the complaint.

The cause of the disease is a microbe, a minute ovoid bacillus, which is found in the blood, organs and contents of the intestines of the infected animals. It passes into their droppings, and so is taken up in the food or drinking water of the healthy birds. Occasionally the disease is introduced

* This article is issued as Leaflet No. 66.

into a flock by the purchase of infected birds, by infection picked up at poultry shows, or by birds being put into contaminated crates belonging to dealers or other persons. The microbe, however, is very easily destroyed by a weak solution of carbolic acid or sulphuric acid. It also dies after an exposure to sun and air.

Symptoms.—The period of incubation is very short, in some cases not more than eight hours, while it rarely exceeds sixteen. Fowls that have pecked the dead body of a comrade have been known to develop the disease in twenty-four hours. The disease takes two forms, the acute and the chronic. In the first case, the course of the illness is very rapid, and it frequently happens that no symptoms are observed, the bird dying before it is noticed as being ill. It may collapse in its walk, or fall from its perch to the ground and die, after giving a few flaps of its wings. But the symptoms when they are noticeable are as follows:—Affected birds become depressed, huddle themselves together and hide their heads under their wings. The feathers become ruffled, the wings and tail droop, and the birds sway from side to side or stagger. The appetite is lessened, while thirst is greatly increased. There is a discharge from the eyes, nose and beak, and the comb and wattles turn bluish red. The most marked symptom, however, is diarrhoea. The evacuations are frequent and watery, being white or yellow at first and becoming greenish and foetid as the disease progresses, while the feathers round the hind parts become matted together. Except in the specially acute form mentioned above, the disease lasts from one to three days, though cases are on record where the illness was prolonged for a week. The birds usually die in a state of stupor or convulsions. The death rate in acute cases is very high, sometimes reaching even 80 or 90 per cent.

In the chronic form the more violent symptoms are not present, but the bird becomes thin and bloodless and suffers from constant diarrhoea. Sometimes there is a breaking out on one or more of the joints, and the inflammation then set up naturally retards the recovery of the sick bird. Towards the end of the epidemic, however, milder cases occur, among which there are a greater number of recoveries. Birds which

get well acquire a certain amount of immunity and if they thrive are valuable for restocking purposes.

Appearance after Death.—In ordinary cases the only marks visible to the naked eye will be found in the intestinal tract, the contents of which are watery, frothy and sometimes bloodstained. In the intestinal wall and particularly in the mucous membrane patches of clotted blood are found, and areas of congestion ranging in colour from red to purple and black. The liver and spleen are usually enlarged, while in some cases the lungs are consolidated. In some places the mucous membrane may be destroyed, and in others patches of yellow exudate may be found. It must be remembered, however, that there are other poultry diseases with which it can easily be confused by the inexpert, and that in certain cases a microscopical examination is necessary.

Precautions.—1. All newly purchased birds should be isolated for a day, and the same course should be adopted in the case of birds returning from a poultry show.

2. Crates and packing material should always be disinfected, and care should be taken to secure an uncontaminated supply of food and drinking water.

3. When the disease appears all infected birds should be strictly isolated, and the healthy ones should be moved to fresh ground. The infected runs and pens should be sprayed with a disinfectant, such as a 5 per cent. solution of carbolic acid, or 2 per cent. of commercial sulphuric acid in water.

Remedy.—There is no practical medical treatment which can be advised for diseased birds. A protective serum is in use on the Continent, but the small value of poultry renders the extensive use of this remedy too costly except perhaps in the case of valuable pedigree birds.

Fowl cholera is a notifiable disease in some Continental countries, and English poultry keepers wishing to sell stock in such countries would be obliged to give a guarantee of freedom from infection.

MINT GROWING FOR THE ESSENTIAL OIL.

GORDON H. GRELLIER, P.A.S.I.

Two varieties of mint, known respectively as black and white mint, are grown in England for the production of the essential oil, but the area under cultivation is very limited and it is believed that it may not exceed 1,000 acres, whilst some authorities estimate that half that area would represent the total quantity that is grown in this country.

White mint was cultivated for many years before the black variety, which produces nearly double the quantity of oil, was introduced, and at the present time only a small quantity of white mint is cultivated to supply the demands of a few old firms of druggists. Black mint, so called from its dark green foliage, was first commercially used about 45 years ago, and it has now almost superseded the other kind, which has a leaf more lanceolate and serrated and of a lighter colour.

Black mint seldom flowers except in hot and dry seasons, and it has not been seen in full flower since 1893, when the summer was hot and dry. White mint differs in this respect, it comes earlier and flowers every summer, and when in full bloom, land planted with it has a somewhat similar appearance to a field of lavender. The flowers in both cases are of a blue colour.

Mint is said to grow best on land that is not more than 200 feet above sea level, and its cultivation is chiefly confined to the district in and about Ewell, Cheam, Carshalton and Mitcham, but it is also grown in the neighbourhood of Burgess Hill in Sussex, as well as at Ashford and Orpington in Kent, and Hitchin in Hertfordshire. It has also been grown in Lincolnshire.

Mint is cultivated in Japan and also in the United States, particularly in Michigan. Growers in the United States, although the quality of their oil is inferior, by sending their produce to English markets have in some measure undersold the home producers.

Cultivation.—Mint is a deep rooted plant with underground stems or runners and it can only be grown profitably on certain soils. It requires a good, light, warm soil, that which suits it best being a deep rich loam on gravel, but it will thrive well

on a chalky subsoil. It likes a moist spring and a dry hot summer. It is grown from roots, not from seeds.

The land is prepared during the winter as for a corn crop, about 20 tons per acre of manure being ploughed in. A fine tilth must be obtained. The plants are dibbled in in May, in rows 12 in. to 15 in. wide and from 12 in. to 18 in. apart. The plants are sold by the bushel and about 10-12 bushels go to an acre. The ground must be kept clean by frequent hoeing.

As a mint plantation only lasts from four to five years it is necessary to form three or four beds that will come on in succession, and this is usually done in the following manner. In the autumn after the crop has been cut, trenches are dug from 8 ft. to 10 ft. apart, 15 in. deep and 18 in. wide, the displaced earth being spread over the plants between the trenches.

When the plants spring up some are transplanted to another bed, the area under cultivation being extended, and so on from year to year, so that at the end of the fourth year, when the first bed is dying out the others, which have been made, take its place and continuous succession is obtained. If the plants are not required for extending the plantations, the land is ploughed with disc coulters and in the spring it is harrowed down. The mint plantations in their second year give the best results, and each year afterwards they gradually deteriorate. When the plantations are broken up at the end of four or five years, the same land should not be used again for mint growing for many years.

Cutting and Distilling.—The mint is cut about the beginning of September, when the plants flower or when a red rust called "snuff" appears on the leaf. The cutting is done by hand with a hook. The crop is left on the ground after cutting to dry, and then packed in Russian mats and carried to the distillery. It is there unpacked and boiled with water in coppers or stills for about six hours. The steam from the boiling mint is condensed in a metal coil of pipes contained in a large vat of cold water and runs into a separator at the bottom of the vat. Here the oil rises to the surface and the water is drawn off. When the vessel is full of oil it is poured into cans and cleared by filtration through "filter paper."

It is then stored in glass bottles called "Winchester quarts" (which contain about 5 lb. each), when it is ready for sale to the wholesale druggists.

Cost of Production.—The cost of growing mint is very considerable, and it is said that if a capital of £10 per acre is considered a fair allowance for ordinary farming operations, at least £20 per acre would be required for mint growing. The plants can generally be obtained, though in limited quantities, at a cost of from 7s. to 10s. per bushel, according to the season and supply, but in seasons when plants are scarce mint growers require them all for themselves and it is difficult for others to get them at any price. To plant an acre about 10-12 bushels are required, and the cost of planting works out at about 30s. and of cutting at from 20s. to 30s. per acre. Mats cost about 9d. each. The cost of distilling may be put down at £1 for 20 mats. The Winchester quarts cost about 4d. each. Although there are public distilleries in Mitcham, most of the leading growers have their own distilleries. A building with two copper stills and other apparatus will cost from £1,200 to £1,500.

An acre of land may be expected to produce 20 to 60 mats, which will yield from 8 to 25 lb. of oil, the quantity of it depending largely on the season.

If there is a plentiful supply of oil it will only sell for about 18s. a lb., but on an average the price would be nearer 25s. In 1907, a wet and unfavourable year for growing mint, as much as 30s. per lb. was obtained.

WATER SUPPLY FOR VILLAGES.

WILLIAM PHELPS, C.E.

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In considering a scheme for a village water supply, the population of the village is usually taken as a basis, but it must be remembered that the number of dairy cows habitually kept in a parish is an equally, if not more, important factor in determining the quantity of water required, as well as in determining the finance of the scheme. This is especially the case in that large and increasing area, comprising

the south-western counties as far as Devonshire, which constitutes the dairy of the metropolis.

Requirements of Dairy Farms.—A fundamental error with regard to the finance of rural water supplies has grown up with the sanitary legislation of recent years ; it is that the water needs of the few dwellers in sparsely populated districts should be supplied at the expense of land occupiers in such districts without reference to their needs or to the burdens laid upon the latter. The need of dairy farmers for an ample and pure water supply has as yet scarcely been recognised even by themselves ; but, concurrently with the enforcement of a legal obligation that every dairy shall be amply furnished in this respect, will come the recognition of the principle that village water supply is largely a question of dairy water supply.

Cost Dependent on Area of a Parish.—The parish being the rating unit, it should be (with limitations) also the water area. An average dairying parish consists of several groups of houses, constituting hamlets more or less distant from each other, with the addition of isolated farmsteads and a cottage or two scattered at somewhat wide intervals over the parish area. It is the topographical distribution of the inhabitants of a parish, rather than their number, which primarily determines the cost of supplying them with water, and the bulk of the cost of any such scheme is expended in the necessarily long lengths of distributing mains. The capital cost which may reasonably be incurred, if calculated in proportion to the population of the parish, may appear almost prohibitive when compared with that usually expended in towns, but not if it be considered in relation to the needs of dairy farms.

Example of Cost.—As an example of a somewhat extreme case the small parish of Emborough may be cited. This scheme has recently been completed at a capital cost per head of no less than £8 18s. 7d. and an annual charge of 12s. 6d. per head. The whole parish (with unimportant exceptions) belongs to a single owner, the financial arrangements have from time to time been submitted to him and the scheme carried out with his full concurrence and that of his tenants, so that the heavy expenditure cannot be considered as being forced on an unwilling community by a council for sanitary reasons. Here we have

168 persons scattered over 1,877 acres of land, which accounts for the large cost per head, but it has been possible to carry out the scheme without creating an undue burden, owing to the existence of eight dairy farms of fair size, all of which were in need of water for dairy purposes. From these farms practically all the revenue is derived. Had it happened that the cottages (about twenty in number) had been outside the parish the scheme would still have been equally feasible, although the cost per head would have been nearly three times as heavy. On the other hand, had there been 100 cottages the cost per head would probably not have exceeded £3, and still the amount of revenue to be derived from these cottages would have been quite inadequate to support the scheme had the dairy farms not existed.

Requirements of Cottages and Dairy Farms compared.—The revenue which can be obtained from a cottage has been more or less definitely limited by statute to 8s. 8d. per annum (2d. per week), and, as the average number of persons to each cottage is about four and a half, the revenue to be obtained from a cottage population is limited to 2s. per head per annum, whereas the author has found that where water is lacking on a dairy farm, the occupier is generally willing to pay as much as 4s. per cow for an ample supply to his homestead for all purposes. Under favourable conditions cows may consume as much as 10 gallons per head per day, and if to this be added the water used for cleansing dairy utensils and for refrigerating the milk, 20 gallons per cow may be used. It is somewhat usual to estimate 15 gallons per head as a reasonable supply for domestic purposes, but in a country district where baths and water-closets are not much in use, one-half this quantity is found ample. It may, therefore, be stated with some confidence that as a revenue-producing item and as a water consumer the dairy cow ranks in advance of the cottage dweller.

Basis of Rating.—The number of dairy cattle that can be supported on a given area of land depends largely on the quality of the land, and, as the rent paid and the rateable value are proportionate, it will be seen that a charge based on the rateable value of a holding will approximately represent the benefits derived from a dairy point of view.

. *Use of Water Meters.*—It has been found that without

a check on the amount of water supplied the consumption and waste at dairy farms may be unreasonably heavy, and this has been met by the introduction of service meters. Precautions are, however, required to secure that the use of the new supply be not made a convenience in the few summer months only and the revenue thus reduced to very small proportions. To meet this point the following plan has been adopted with success. For every farm to which a supply is given a minimum half-yearly charge is made for a fixed maximum allowance of water based upon the assessable value of the holding for special purposes, *i.e.*, land being rated at one-quarter the rate at which the buildings are rated. This basis has been found to work well in practice and has the further advantage of being the basis of a special sanitary rate, as fixed by statute. The quantity of water allowed without extra charge is fixed by the "scale of charges by meter," and should this amount be exceeded the excess is charged at a fixed rate, provided in the "scale." A scale largely in use is as follows :—

	<i>L s. d.</i>
5,000 gallons or under per half year	... ... 0 15 0
Intermediate at 2s. 6d. per 1,000.	
10,000 gallons per half year	... ... 1 7 6
Intermediate at 2s. per 1,000.	
20,000 gallons per half year	... ... 2 7 6
Intermediate at 1s. 10d. per 1,000.	
35,000 gallons per half year	... ... 3 15 0
Intermediate at 1s. 8d. per 1,000.	
50,000 gallons per half year	... ... 5 0 0
Intermediate at 1s. 6d. per 1,000.	
100,000 gallons per half year	... ... 8 15 0
Intermediate at 1s. 3d. per 1,000.	
200,000 gallons per half year	... ... 15 0 0
All above 200,000 per half year	1s. per 1,000.

In some instances all that portion of the scale above 50,000 gallons is omitted, making 2s. per 1,000 the highest charge, whilst percentage reductions from scale are made in favourable cases, in one case amounting to as much as 50 per cent.

Minimum Charge.—The minimum charge and the extent to which it may be increased are of the greatest importance, as it is found that where meters are in use the quantity allowed at this charge is rarely exceeded. The highest minimum charge in the author's experience was adopted at Baltonsborough and is a half-yearly charge of 1s. in the first

on buildings and 3*d.* in the £*1* on land. The parish is a fairly large one, having an area of 2,720 acres, a population of 617, and an assessable value to special sanitary rate of £2,560. Dairy farming is almost universal, and the need for water general, so that every farm in the parish has been supplied on the stated basis, except that £4 per half-year was, for special reasons fixed as the highest limit of minimum charge. The total cost of the scheme was £4,200, and it should be noted that an additional £1,000 would have reached the limit of borrowing power, as laid down by the Public Health Act, 1875.

The assessable value of a parish then may be taken as the proper basis on which to calculate expenditure, and no limit of cost other than that laid down by the Act is in favourable circumstances necessary ; as a general rule a minimum charge equal to a yearly special rate of 2*s.* in the £*1* will not be found prohibitive (in the case of Emborough without meters, already cited, a charge of 4*s.* in the £*1* is made). Where the consumption of water is general the charge thus made will obviate any appreciable charge on the general rates of the parish to cover a deficiency of revenue.

Consumption of Water under the Meter System.—It is not to be supposed that the consumption of water by dairy farms under the meter system will approach the 20 gallons per cow mentioned above as a possible consumption. Existing sources of supply are under this system made use of, and experience shows that water is little used, either for cattle drinking or refrigerating purposes, where its use is thus controlled. Three to four gallons per head of stock is as much as is generally consumed. It may well be that sanitary considerations are sometimes sacrificed to economy of water under this system, and that a more rigid inspection of existing supplies would lead to increased consumption. Where the supply is ample and the main cost of the scheme is secured by minimum charges, as outlined above, there is no reason why the above meter scale should not be much reduced with a view to encouraging an increase of consumption. It is found that where the meter system is not in use 10 to 15 gallons per head of stock is no unusual quantity to be consumed and this is often exceeded.

No mention has been made of private dwelling houses of a class superior to cottages ; but, generally speaking, a rate may

be charged on these equal to the minimum charge imposed on farm buildings but without requiring the use of meters.

The following table gives particulars of several schemes which have been carried out on the above lines :—

TABLE A.

Name of Parish or Scheme.	Total Area of Parishes Supplied.	Population.		Capital Cost of Scheme.	
		Total.	Actually Supplied.	Total.	Per Head of Population Supplied.
Ditcheat and Baltonsborough. (Gravitation) ..	Acres.	No.	No.	£	£ s. d.
6,423	1,291	1,260	9,832	7 16 0	
Stoke S. Michael and Holcombe. (Gravitation) ...	2,792	1,135	875	3,400	3 17 9
Ashwick and Binegar. (Partly by oil engine) ...	3,004	1,228	538	2,717	5 1 0
Doultong. (Wind engine)...	3,522	695	240	1,540	6 8 4
Emborough. (Oil engine...)	1,877	168	168	1,500	8 18 7
Name of Parish or Scheme.		Annual Cost of Repayment Loans.	Annual Working Expenses.	Total Annual Revenue.	Annual Cost. Per Head.
		£	£	£	s. d.
Ditcheat and Baltonsborough. (Gravitation) ..	526	37	454	8 11	7 2½
Stoke S. Michael and Holcombe. (Gravitation) ...	181	21	184	4 7½	4 2½
Ashwick and Binegar. (Partly by oil engine) ...	116	43	112	5 11	4 2
Doultong. (Wind engine)	78	22	19	8 4	7 7
Emborough. (Oil engine)	80	25	87	12 6	10 4

CATERPILLARS.—Specimens of rose buds infested with the caterpillar of a Tortrix moth were received from Woodside Park (Middx.) ; the presence of this caterpillar is indicated by the spinning together of the leaves, and the remedy is to pick and burn the attacked buds in order to prevent the development of the caterpillars.

**Notes on Insect,
Fungus, and other
Pests.***

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* Notes on insect, fungus and other pests, dealing with the specimens submitted to the Board for identification, and their apparent prevalence, appear in this *Journal* month by month. The notes commenced with the issue for June, 1907.

Specimens of the larvæ of the Winter Moth and the Mottled Umber Moth were received in early June from Derby, where they were doing much harm (see Leaflet No. 4).

BEETLES.—Specimens of the Pigmy Mangold Beetle (*Ato-maria linearis*) were received from Chichester, and seedling mangolds from Woking had every appearance of having been destroyed by the same pest. This beetle is very small and therefore easily overlooked, so that every year the loss of seedling mangolds which are really destroyed by this pest is attributed to some other cause.

Specimens of a beetle sent from Stroud, which was stated to be attacking apples, pears, raspberries, currants, strawberries, peas, broad beans, runner beans, beet, roses, &c., were identified as the Garden Chafer (*Phyllopertha horticola*), a beetle dealt with in Leaflet No. 25. They should be collected during the swarming period, if possible before pairing takes place, and killed by dropping them into boiling water.

FLIES.—Specimens of plants from Nottingham, Mablethorpe (Lincs.), and Leeds, were all found to be infested with the maggots of the cabbage root fly (Leaflet No. 122). In cases where the attack is very severe it would be advisable to pull up and burn the plants most badly infested, while the free use of the hoe round the remainder would tend to the destruction of the maggots and pupæ.

Parsnip leaves from Salisbury were infested by the maggots of the fly *Acidia heraclei*, a troublesome enemy of celery and parsnips, dealt with in Leaflet No. 35.

From Salisbury also holly leaves were received and found to be attacked by the Holly Leaf Miner (*Chromatomyia ilicis*), a tiny fly, one-tenth of an inch in length, which was described in this *Journal* in July, 1907, p. 218.

OTHER PESTS.—Larch from Briton Ferry (Glam.) was infested with aphides, as were also gooseberry cuttings from Llanelly; a branch of nectarine from Liphook (Hants.) was covered with the common Brown Scale (*Lecanium persicæ*) of the peach, described at p. 195 of the *Journal* for June, 1908; red spiders (Leaflet No. 41) were the primary cause of disease of peaches from North Walsham; and millipedes (Leaflet No. 94) of the species *Julus pulchellus* were forwarded from a mangold field at Cullompton (Devon).

FUNGI.—Peaches from Feltham (Middlesex) were infested with the fungus *Botrytis cinerea*, which only assumes a parasitic habit when there is an excess of moisture present. Early morning ventilation is necessary.

Plum tree stems from Somersham were stated to be killed, owing to disease, but the only fungus present was *Tubercularia granulata*, Pers. Up to the present, however, this fungus has been considered as a saprophyte.

Tomato leaf rust (*Cladosporium fulvum*) was badly infesting tomatoes forwarded from Huddersfield. At intervals of three days the plants should be sprayed with a solution consisting of 1 oz. of potassium sulphide (liver of sulphur) in 4 gallons of water. Badly diseased leaves should be removed and burned.

Cucumbers from Broxbourne were infested with cucumber and melon leaf blotch, *Cercospora melonis* (Leaflet No. 76); apple specimens from Farnham and Holmes Chapel were attacked by apple scab (Leaflet No. 131); gooseberry leaves from Morpeth and Chard were affected by Gooseberry Cluster-Cup disease (see Leaflet No. 209); barley from Taunton was affected with "blindness" (see Leaflet No. 159).

Spraying Mixture for Mildew.—It may perhaps be said that the best all-round mixture for mildew is a solution of liver of sulphur at the rate of 1 oz. in 4 gallons of water, preferably rain water.

The action of this solution on many plants, however, is not known, and it would be well to experiment with half-strength solution at first. Peach leaves, for example, soon scorch if the foliage is at all soft; if bearing fruit, spraying is not advisable, but the foliage only may be sponged with the solution.

The Departmental Committee appointed in 1907 by the President of the Board of Agriculture and Fisheries to inquire into the subject of agricultural education

**Report of Committee
on Agricultural
Education.** has now presented its report, together with the minutes of evidence.* The Committee were requested to inquire as to the provision which has now been

* Report, Cd. 4206. Price 9d. Appendix, containing Minutes of Evidence and Index, Cd. 4207. Price 5s. 3d.

made for affording scientific and technical instruction in agriculture in England and Wales, and to report whether, in view of the practical results which have already been obtained, the existing facilities for the purpose are satisfactory and sufficient, and, if not, in what manner they may with advantage be modified or extended.

The Committee was constituted as follows :—The Right Hon. Lord Reay, G.C.S.I., G.C.I.E. (Chairman), the Lord Barnard, the Lord Belper, Lord Moreton, Mr. Francis Dyke Acland, M.P., Mr. David Davies, M.P., Mr. Norman Lamont, M.P., Mr. Thomas Latham, Mr. John Charles Medd, Professor Thomas Hudson Middleton, M.A., M.Sc. (one of the Assistant Secretaries of the Board of Agriculture and Fisheries), Professor William Somerville, D.Sc., Mr. Henry Staveley-Hill, M.P. Mr. A. E. Brooke-Hunt acted as Secretary and Mr. H. L. French as Assistant Secretary to the Committee.

The Committee made an exhaustive inquiry into the subject and examined in all 113 witnesses, consisting of landowners, farmers, farm managers, estate agents, scientific experts and investigators, together with members of the teaching profession in its various branches associated with agriculture, or with general university education. The report is signed by all the Members of the Committee, while a short supplementary report by Mr. J. C. Medd deals with certain points not touched on in the main report.

The first portion of the report contains a brief review of the history of agricultural education in this country up to the present time. The existing facilities for agricultural education in England and Wales are discussed and the progress of practical and scientific instruction in this country during the past twenty years is referred to as satisfactory, though the Committee are of opinion that much remains to be accomplished before the subject is placed in the condition which its importance demands. There is unmistakeable evidence that the attitude of farmers towards education, which was formerly one of indifference, has undergone, or is undergoing, a marked change; keen interest is now taken in the work of many institutions, and a number of improvements in farm practice can be directly traced to their influence.

Higher Agricultural Education.—As regards the higher

agricultural education, afforded by universities, university and agricultural colleges, the Committee are satisfied that the addition of a few institutions, so located as to supply the needs of one or two districts which at the present time have no agricultural college, would furnish the country with a sufficient number of collegiate centres.

Lower Grade Education.—The facilities for agricultural instruction of a lower grade are, however, considered to be unorganised, unsystematic, and wholly inadequate. Very few institutions giving instruction of this grade exist, and the Committee consider that their number must be materially increased. The type of institution recommended is the winter agricultural school, which would aim at providing courses of study, during the winter months, for lads of from seventeen to twenty, who have already gained some practical acquaintance with agriculture or horticulture. Until such schools are available, the formation of local winter classes should be encouraged. Short winter courses at colleges also provide instruction for the class that would attend the winter schools, and it is considered that instruction of this type would be welcomed if generally available.

A number of suggestions are also made as regards instruction in the different branches of agriculture, and as to the supply of teachers and instructors.

County Agricultural Advisers.—The Committee suggest that in each area of the size of an average county there should be a resident agricultural adviser, to convey information and instruction to the farmers, to supervise field experiments, to give courses of lectures on the subject of such experiments and on matters of agricultural interest, and to conduct special classes. He might act as director of agricultural instruction, and should consequently be in close touch with, and responsible for, the work of other instructors in subjects such as dairying, poultry-keeping, or horticulture. At the same time he should be attached to, and work in association with, a college or place of higher instruction acting for a group of counties.

Itinerant Teachers.—The Committee are strongly of opinion that itinerant instructors should play an important part in the educational system of Great Britain. If well-qualified men were obtained for these positions, farmers—especially small

farmers—would soon learn to go to them for advice. Itinerant teachers, it is observed, have many more opportunities than college lecturers of meeting those actually engaged in cultivating the soil and thus, if possessed of knowledge, practical skill, and the faculty of inspiring confidence, they should rapidly influence the different branches of the industry.

Farm Institutes.—For the purpose of maintaining teachers at a high level of practical skill, the Committee think it essential that they should be connected with some institution where they would be in constant touch with practice. It is suggested, therefore, that in those districts where there is no suitable institution in which the county instructors could be associated, farm institutes, having a farm and class-rooms attached, should be established to serve as headquarters for the entire itinerant staff working in the district. The farm should be laid out so as to be typical of the district and should generally aim at placing before farmers and gardeners an object-lesson for guidance in their work. These institutes might be combined with the winter schools, and the buildings could be utilized for this purpose in the winter, and in the summer for the teaching of dairying and other appropriate subjects.

It is pointed out that the establishment of such institutes is much to be desired in the interests of small holders, to whose success they might largely contribute by providing information and advice. The combination of the winter school and the farm institute should first be attempted in those districts in which holdings of small and medium size are most numerous.

Research in relation to Education.—For the purpose of improving and extending a knowledge of the application of science to practice, and thus increasing the appreciation of education by agriculturists, the Committee are of opinion that further provision for research is urgently needed. The need is not so much for new institutions as for a greater number of men, and they recommend that before any further stations for research are established, existing institutions should be enabled to increase their staff of workers. It would be unwise to develop any extensive system of providing instruction in agriculture without at the same time providing for research, so as to lay the foundation, which all experience has proved to be necessary for a successful result.

Experimental Work.—In connection with this subject, the Committee consider that much good has resulted from the field experiments and demonstration plots arranged by the various institutions, but that more public advantage would accrue, if they were systematized. They suggest that it would usually be a great advantage if the results of field experiments were only published after the figures of three, four or five seasons were available, or possibly after two years in those cases where a number of similar experiments were made in a district in each season. The results of the more important experiments should be summarised at regular intervals, and might then be published in the *Journal of the Board of Agriculture*, so as to be available to the agricultural public generally. In view of the large sums spent upon experiments, and of the important influence which they ought to have upon agriculture, the Committee are of opinion that the Board of Agriculture should give very special attention to collating the results, comparing them with the results of similar work conducted in other countries and extracting and publishing such facts as may have a direct bearing on the practice of agriculture in this country.

State Control.—The Committee devote much attention to a consideration of the question whether the work of agricultural education should be supervised and assisted by the Board of Agriculture, as at present, or by the Board of Education. After carefully examining the subject in all its bearings they come to the conclusion that scientific and practical instruction in agricultural subjects, when provided by universities, university colleges, agricultural colleges, farm institutes and winter schools, or by means of special classes or courses of lectures in agriculture and kindred subjects (*e.g.*, dairying, horticulture) should be under the direction of the Board of Agriculture; while all instruction in agricultural subjects forming part of courses of study in primary, secondary, or such evening schools as are in definite continuation of the education given in primary schools, should be under the Board of Education. In some cases the subjects taken up by scholars attending evening classes would more appropriately be dealt with by the Board of Agriculture; but as the evening work would usually be carried on by teachers from day schools, it would, in the opinion of the Committee, be on the whole more convenient that their work should be inspected by officers of the Board of Education.

After discussing in detail the grounds on which this opinion is based, the Committee observe that they deem the question to be one of grave importance to the agriculture of this country and have arrived at the conclusion that, since Parliament has recognised the supreme importance of agriculture to the nation by creating a separate Department of State to look after its special needs and requirements, to this Department should the care of agricultural education be entrusted. If the present powers of the Board of Agriculture as to education were taken away, its utility and influence must be impaired. In view of the difficulties which have of late attended the agricultural industry, of the recent effort of the State to remedy and to minimize those difficulties by the establishment of the Board, and of the confidence which the agricultural community have come to place in it, any reduction of its powers would be a retrograde step.

Further funds.—The funds at present available for agricultural education are considered wholly inadequate, and considerably increased funds need to be provided, the main source of which must be the National Exchequer. Such funds should be employed by the Board of Agriculture, first, to aid existing and projected institutions in respect of their staff and general equipment ; and secondly, to aid local authorities in making provision for the agricultural work conducted by them.

Conclusion.—In addition to the points referred to above, the Committee make a number of other recommendations, and in concluding their report state that they are convinced that agricultural education is of such vital importance to the United Kingdom that no effort should be spared in making the provision for it as full and complete as possible.

The ultimate aim of instruction in agriculture is to improve and to increase agricultural produce, and there is no doubt but that by a general adoption of scientific methods an important development could be effected in every branch of agriculture and in the various rural industries subsidiary to it. By this means, without diminishing the supply of meat and cereals grown in the country, a large proportion of the butter and cheese, the poultry, the fruit and vegetables (to say nothing of the timber) now imported from abroad could be remuneratively produced at home.

The possibility of additional employment as a result of improved education ought not to be overlooked. Additional employment would enable a larger population to find a living upon the land. This consideration is of high moment to the maintenance of the physical standard of the race, for the rural population has not only to replenish its own numbers, but, as a town-bred population rapidly deteriorates, to supply the ever-increasing demands of our great cities for healthy men and women workers.

In view of the heavy rates necessary in respect of rural elementary education, the incidence of which falls mainly on the agricultural population, it is only fair that every possible facility should, in return, be afforded for technical agricultural instruction. Nothing in our system of education should hinder any lad from seeking his life's work upon the land. On the contrary, all that is possible should be done to show him how, by the application of skilled knowledge, agriculture holds out the prospect of not only an interesting but a profitable career. A complete system of technical agricultural education is, therefore, the natural corollary to the vast sums spent on elementary education in the rural parts of the country.

The Select Committee of the House of Commons appointed to inquire into the past and present condition of the hop industry have issued their report (H. C. Report of Committee 213, price 5½d.), together with an appendix containing the minutes of evidence and numerous tables. The report also contains the draft reports proposed by Mr. Courthope and Mr. Gretton. The statistics laid before the Committee showed that there had been no material falling-off in the home production of hops in the period since 1885, when figures as regards production were first collected. On the other hand, there had been a very considerable decline in the area under cultivation, and the acreage during the past twenty years has been reduced by one-third. The explanation of this apparently paradoxical result is to be found in the increased yield per acre, which has especially characterized the last fifteen years.

The Committee review the position of the industry in the

various counties of England, and describe the different varieties and qualities of hops, the cost of production, labour, and picking, and the method of drying, pocketing, and marketing.

Cold Storage.—Among the influences which have co-operated to the detriment of the English industry, special importance is attached to the system of cold storage which has been introduced during the last ten or fifteen years.

It is pointed out that the advent of cold storage has effected an adjustment between years of plethora and years of scarcity, and has thus had a levelling effect on prices. Hops stored in the ordinary way deteriorate by reason of the essential oil resinising, by oxidation of the preservative resins, and by reduction in the amount of tannin. By means of cold storage these changes are very materially retarded, and, indeed, hops so treated after even four or five years show very little reduction in their brewing qualities. Similar results are said to be obtainable by keeping hops unexposed to air.

The Committee state that there can be no doubt that the introduction and rapid extension of the cold storage system has had a potent influence on the market. Brewers now do not have to purchase new hops in September and October for "freshening up," as was formerly the case. Such purchases, Mr. Hanbury informed the Committee, are now "done away with almost entirely, owing to cold storage; the best cold storage hops that are put away the year before are taken out in September and October and found to be perfectly fresh, and they answer that purpose." The brewer is thus, as it were, enabled to use a new hop all the year round, with the maximum preservative properties. The same witness illustrated the effect of cold storage on prices by the following experience, which he related. He said: "Two years ago, when hops were very cheap, the brewers bought large quantities and put them into cold storage. In my own firm then our cold store was quite full. We then took another one and also filled that up, and eventually we had to put hops away elsewhere as well. So that brewers took advantage of a cheap year and bought largely and put the hops away with the view of safeguarding themselves against high prices in years to come."

Other Influences.—In addition to cold storage, and apart from any question of foreign imports, the Committee think

that many influences have been at work, tending to exert a depressing effect on the prices obtainable by English growers. Among these are the reduced consumption of beer and the diminishing proportion of hops used in the production of beer, coupled with the maintenance of the home produce, which have caused the supply to exceed the demand. To a small extent the use of hop substitutes and supplements, and in 1904 and 1905 "the arsenic scare," may have had some effect ; and, in addition to these relatively recent influences, there have been the more permanent factors of the unequal treatment of the home and foreign grower of hops in the matter of "marking" and possibly also in the matter of railway charges, the burden of the extraordinary tithe, the rise in rates, and, according to some witnesses, the system of tenure of hop lands.

Foreign hops.—Much attention was given by the Committee to the question of the importation of foreign hops, and it appeared that the amount of foreign importation has, during the last thirty years, shown no tendency to increase, but, on the contrary, has exhibited some reduction. The proportion of home-grown hops used by brewers in the United Kingdom amounts to more than 70 per cent. of the total quantity they employ.

The Committee state that they are not prepared to recommend the re-imposition of a duty on foreign hops, but they think that the Legislature might reasonably require that the use of foreign hops should be declared by individual brewers, and that the extent to which foreign hops are used in the brewing of beer should be indicated on the cask or bottle in which the beer is sold. Consumers would then be in a position to answer the question, which at present is left in doubt by the evidence, as to how far the present taste requires that foreign hops should be used in the brewing of beer or how far the use of such hops can be safely dispensed with.

Hop Substitutes.—As regards hop substitutes, the Committee observe that growers and brewers appear to be generally agreed that they can be safely dispensed with. They cannot in any true sense supply the peculiar properties of the hop, they introduce an unnecessary and a foreign element into the process of brewing, they may be the source of dangerous contamination,

and, in the opinion of the Committee, their employment should be prohibited by the Legislature.

Marking of Foreign Hops.—Foreign hops are for the most part unmarked, whereas English hops are required to be marked, in accordance with the Act of 1866, and the Committee recommend that such provisions of this Act as can be made applicable to imported hops should be so applied. Hops grown abroad would then not be admissible into ports of the United Kingdom, unless such conditions were complied with.

Information for Growers.—The report concludes with a recommendation that additional information should be placed at the disposal of the industry by the Board of Agriculture.

The attention of the Board has been called to a number of cases in which the husk and woolly fibre in decorticated cotton cake has been found to be as much as 15 per cent. Formerly it was not usual to find more than 5 per cent. of such substances in decorticated cotton cake, but the term decorticated is now not uncommonly applied to an article containing a much higher percentage.

The question how far sellers are justified in applying the term decorticated to a cake which contains so much husk and woolly fibre is one of considerable difficulty, nor will it be possible in existing circumstances to say what is the limit of husk and woolly fibre which may be legally present in an article sold as decorticated cotton cake. In view of the uncertainty of the meaning of the term "decorticated" in this connection, purchasers of decorticated cotton cake should insist on a written statement from the seller as to the amount of husk and woolly fibre it contains.

In this connection it may be of interest to give a brief description of the method of manufacturing this class of cake.*

The cotton seed is first ginned in the process of obtaining the lint for cotton manufacture, the ginned seed being then

* See U.S. Dept. of Agric. Office of Experiment Stations, Bulletin No. 33-The Cotton Plant.

utilized for the manufacture of cotton-seed oil, the ultimate by-product being cotton-seed cake.

In obtaining the oil the seed is first screened and well cleaned of foreign substances, sand and dust, it is then passed through large gins which remove the short fibres or linters, delinting being necessary to remove the down which otherwise would absorb the oil and prevent it from being extracted. The process also renders the seed easier to plant and improves the hulls for stock feeding.

From the linter the seed passes to the huller, a strong cylinder furnished with knives, which cut the seed to pieces, the loose kernel dropping out. The chopped mass of seed, kernel and hull is then screened, most of the hulls being retained at this stage. The kernels fall into a box and pass on to a separator or shaker, and here the short down adhering to the remaining hulls causes them to felt or stick together and prevents them falling through with the kernels. In the case of Egyptian and Sea Island cotton the seed is not provided with this down, and the kernel and hull cannot be separated as thoroughly as is done with the American Upland seed; as a consequence the oil and cake made from them is of inferior quality.

The kernels are next crushed by heavy rollers which mash them into thin flakes. Cooking in steam-jacketed kettles follows, and the kernels are subsequently shaped into cakes wrapped in camel's haircloth and then subjected to a pressure of 3,000 or 4,000 lb. per square inch by hydraulic power. This removes the oil, and the cakes, pressed as solid as boards, are taken from the press, stripped of the cloths and finally stacked to dry. To make cotton-seed meal these cakes, when dry, are passed through a cake crusher, which breaks them into fragments of a size suitable to be fed to a mill. The mill grinds these fragments into a fine meal, which is put up in sacks. Sometimes the meal is bolted to separate it from small pieces of the hull, which, being tough and leathery, are not readily ground up.

The cakes referred to above constitute decorticated cotton cake, the hulls of the seed having been removed before the expressing of the oil. Undecorticated cotton cake, on the other hand, is made from the whole seed without removal of the hulls.

Adulteration.—According to Winton* the yellow meal obtained by grinding the decorticated cake obtained from Upland cotton-seed is often grossly adulterated with ground cotton hulls, and occasionally with rice refuse. Finely ground hulls, owing partly to the fine state of division of the dark-coloured matter, and partly to the exposure of the nearly colourless palisade cells, is not so dark as the coarsely ground hulls and more readily escapes detection in the meal.

The following table gives the percentage composition of various cotton-seed products, as given in the above-mentioned United States Bulletin:—

PERCENTAGE Composition of Cotton-Seed Products.

		Ginned Seed (Average of 25 Analyses).	Hulls (Average of 22 Analyses).	Hulled Seed (Average of 7 Analyses).	Undecorticated Cotton-seed Cake (Average of 62 Analyses).	Decorticated Cotton-seed Cake (Average of 429 Analyses).
Water	...	9.92	11.36	6.94	11.64	8.62
Ash	...	4.74	2.73	6.92	6.26	7.05
Protein	...	19.38	4.18	30.35	24.08	44.09
Fibre	...	22.57	45.32	4.76	20.68	5.16
Nitrogen, free extract	...	23.94	34.19	21.39	31.43	20.85
Fat	...	19.45	2.22	29.64	5.91	14.23

It will be seen that the fibre in undecorticated cotton cake in these analyses averaged 20.68 per cent., while that in decorticated cotton cake was 5.16 per cent. It is evident, therefore, that "decorticated" cotton cake, such as that referred to in the first paragraph of this article as containing 15 per cent. of fibre, approaches and more nearly resembles in this respect "undecorticated" cotton cake. From the description of the process of manufacture, it would appear that the excessive quantities of husk and woolly fibre present in many of the decorticated cotton cakes now on the market are not due to difficulties in manufacture but to deliberate adulteration.

* Microscopy of Vegetable Foods, 1st ed. 1886, p. 206.

The sunflower (*Helianthus annuus*, L.) is sometimes grown in this country for the seed, which is very useful as food for poultry. The yield of seeds may be

Sunflower Seed. 8 cwts. per acre and upwards, and the price quoted at Mark Lane for

English sunflower seed in May last was as follows:— White, 17s. to 19s. per cwt.; black, 13s. to 14s.; and striped, 11s. to 12s. Current prices, however, are 1s. lower for black and striped seed, and 3s. to 4s. less for white seed. The supply is believed to be small, though there is some demand for this seed as a food for cage birds. In many European countries—particularly in Russia, Hungary, Italy, and Germany—the sunflower is cultivated for the oil, and the oil-cake left after extracting the oil is used for cattle. The seed is also largely eaten, either salted or roasted, in the towns and cities of Russia, particularly at certain times of the year.

The method of cultivation resembles that of maize, and the following directions are given by Dr. H. W. Wiley, of the United States Department of Agriculture:—

" If the soil is not naturally fertile, liberal fertilisation must be practised in order to secure large crops. The soil should be prepared by careful ploughing, and the surface of the ploughed soil should be reduced to a good tilth by the use of the harrow. Sunflowers are best planted by a drill in rows from 3 to 3½ ft. apart. In order to secure a good stand, the seeds may be placed by the drill 2 or 3 in. apart; but should they all grow, at least half of them should be cut out when the plants are thinned. The seeds should be planted deep enough to secure abundant moisture to germinate them; from 2 to 3 in. in depth when the soil is not too heavy will be found the best. With heavy, stiff soils, which are likely to become very hard on the surface after heavy rains, it is better not to plant the seeds so deep. The seeds should be planted as early as possible in the spring, as they endure very well a slight degree of cold. After the plants are well formed they should be thinned so as to stand at a distance of from 12 to 18 in. in the row. The cultivation should be of the ordinary kind, mostly superficial and sufficient to prevent the weeds from growing and to preserve the moisture during periods of drought. When the production of seed is sought, the best results are secured by limiting the

number of seed heads on each plant to a very few. The superfluous heads, when formed, should be removed."

In a recent number of the *Cape Agricultural Journal* (January, 1908), it is stated that about 10 to 15 lb. of seed per acre is required. The plants take from three to four months to mature. The heads should be harvested before they are thoroughly ripe, and well dried to prevent the formation of mould. The seeds can then be thrashed out with flails, or they may be removed by means of revolving cylinders studded with nails. The yield of seed per acre is usually from 900 to 1,500 lb., and the quantity of oil obtained is from 15 to 20 per cent. of the weight of seed.

Sunflower seed cake does not appear to be used in this country. It is produced principally in Russia and Hungary, Buda Pesth, Riga, and Stettin being the chief markets, and is fed to all kinds of stock. The average composition on the basis of fifty-five analyses by Dietrich and Konig is given as follows :—Water, 9·24 per cent.; nitrogenous matter, 34·66 per cent.; fat, 14·53 per cent.; nitrogen free extract, 22·29 per cent.; fibre, 12·60 per cent.; ash, 6·68 per cent. In some experiments made by Dr. Klein, of Proskau, with a view to testing the effect of sunflower seed cake on milk cows, the cake was considered to have increased the flow of milk, but the live weight of the animals and the fat content of the milk were not affected. Dr. Klein considered that the experiment showed this cake to be superior to linseed cake.

Some further information on the subject will be found in the *Agricultural Ledger*, 1907, No. 1, which contains an article on the sunflower in India by David Hooper, F.G.S., F.L.S.

The conditions of the milk supply of the East and West Ridings of Yorkshire have recently formed the subject of an exhaustive investigation on behalf of
Contamination of Milk. the County Boroughs of Bradford, Hull, Leeds, Rotherham, and Sheffield, and of the County Councils for the East and West Ridings. A Joint Committee was appointed composed of representatives of these local authorities, their medical officers, and of members of the Yorkshire Council for Agricultural Education. This Committee appointed Mr. Thomas

Orr, M.B., B.Sc., of Glasgow University, as bacteriologist, and his report on the examination of the samples, with particulars of the various experiments carried out by him, has now been published, together with the report of the Joint Committee.*

The investigation showed that serious contamination, which is to a great extent of a preventable nature, does take place. The greatest amount of contamination occurs at the cow-shed, and is largely attributable to the dirty condition of the cows' udders, and the imperfect cleansing of the cans. The extent to which bacteria, present in the milk as it leaves the cow-shed, multiply before the milk is consumed is mainly a question of the temperature at which the milk is kept and the time that elapses before consumption. Contamination during railway transit, however, is considered to be practically avoidable if the milk cans are locked and provided with dust-proof lids, and the practice of pouring the milk from one can to another in the dusty atmosphere of the railway station is avoided. Additional contamination arises from exposure to dust in the retail shop, during delivery, or in the consumer's house, and from badly cleaned retailers' cans or consumers' vessels.

The Committee draw special attention to the experiments of Dr. Orr with regard to the washing of cows' udders, and also to that part of the report which deals with the conveyance of milk in vessels which are not ventilated.

They point out that there is a widespread opinion in the country that it is a dangerous thing to wash a cow's udder, and that milk will not keep except in a ventilated vessel. The experiments systematically conducted by Dr. Orr for a period of about six months indicate that a cow's udder can be washed with safety, and that one of the greatest sources of contamination of milk at the farm can thus be successfully combated. If it can be shown that milk will keep in vessels which are not exposed to the air by means of ventilating openings, a fruitful source of railway contamination can be dealt with satisfactorily, and a common excuse for the exposure by the retailer or consumer of milk in an uncovered bowl will be disposed of.

The points to which the Committee draw attention are as follows :—

* Copies of the Report, price 2s. 6d., can be obtained from the Clerk of the Council, County Hall, Beverley.

As regards the Milk-Producer.—(1) The absolute necessity of cleaning the udder and flanks of the cow, and of washing and sterilising the receptacles in which milk is placed. (2) The desirability of rejecting the “fore-milk” and of removing the milk when drawn, as rapidly as possible, to a dust-free atmosphere. (3) The great improvement in keeping properties which may be effected by cooling the milk to 50° F. as soon as possible by means of a clean cooler suitably protected from dust or other contamination. (4) The provision of cans with lids of such a type as to render contamination from without impossible. The cans in which milk is forwarded should be locked or sealed.

As regards the Railway Company.—(5) The urgent necessity for rapid transit, especially during warm weather. (6) The provision of special vans—kept scrupulously clean and reserved for the milk traffic. (7) The necessity of maintaining the milk at a temperature not exceeding 50° F. during the time it remains in their charge. (8) The provision of a special shed in which milk should be placed immediately on its arrival at the station. This shed should be kept clean and cool, and used only for milk traffic.

As regards the Retailer.—(9) The undesirability of transferring the milk from the farmer's can, as is usual at present, in the station precincts. (10) The prime importance of scrupulous cleanliness in all details of the handling of milk. (11) The desirability of thoroughly cleansing the farmer's cans before returning them. This implies the necessity, after washing out with clean cold water, of maintaining the can, &c., for some time at steam heat, in order to ensure thorough cleansing and sterilisation, or, failing a supply of steam, a thorough scalding with an abundance of boiling water. (12) The necessity of complete protection of all milk from dust prior to sale. (13) The importance of keeping the milk at a temperature not above 50° F.

As regards the Consumer.—(14) The necessity for scrupulous cleansing and scalding with boiling water of vessels in which milk is placed. The further necessity of protecting the milk from dust during storage, of keeping it as cool as possible, and certainly at a temperature not exceeding 50° F.

As a result of their investigation the Committee are of opinion

that a much cleaner and more wholesome supply of milk can be obtained without a costly outlay in premises or special apparatus. In dealing with an article that is so easily contaminated as milk, details which are very commonly regarded as trifling are really of the greatest importance, and painstaking care at every point, with scrupulous cleanliness in person and habit, is absolutely essential. This involves intelligent supervision on the part of those owning or managing cowsheds, better arrangements on the part of the railway companies, and the exercise of care on the part of retailers and consumers.

At a conference held at the National Fruit and Cider Institute in May last, the Hon. Secretary of the Institute, Mr. W. J.

Grant, delivered an address on the

**Planting a Cider
Orchard.** Planting of a Cider Orchard, with special

reference to the proposed formation of a number of typical cider and perry

orchards in the counties interested in this industry. Some extracts from Mr. Grant's paper are reproduced below :—

Planting.—Always select as far as possible a well-sheltered position, protected from east and north-east winds.

The ground having been marked out and the site for each tree determined upon, open the holes for each tree not less than 4 feet across each way, place the top spit on one side and the loose shovellings also by themselves ; then break up the sub-soil with a fork or pick, and fix the stake to which the tree is to be fastened and also the posts for the guard by which the tree is to be protected from live stock. Then knock some of the soil off the turf, turn it upside down in the opening for the tree, and plant the tree on top of the overturned turf. The roots should be carefully spread all round, and the fine dry soil used for covering them. After the tree is firmly planted, temporarily secure it to the stake. In the following spring the tree should be retied after the soil is firmly set about it. Carefully mulch the whole of the ground that has been moved with rather long farmyard manure, as this mulching protects the roots from the extremes of heat and cold, and encourages the formation of roots near the surface instead of in the cold inert lower sub-soil. This mulching also will, in warm weather,

retain the sun heat, so that every shower that falls brings to the young tree an acceptable dose of warm soluble food.

In planting on a stiff, cold, retentive soil the trees must be planted either on mounds or very near the surface. The mode of planting must, however, be determined by the situation of the land.

Pruning.—In the case of trees that have arrived direct from the nursery, the first pruning to be carried out is the root pruning, taking care that the end of every root that has been roughly cut through in lifting is carefully cut back to a sound end with a sharp knife, removing, if necessary, any badly injured roots, as these, if left, may be the cause of trouble when the tree is practically in its prime. Should it be inconvenient to plant the trees at once, they should be root pruned on their arrival, so that the roots may commence to repair their wounds by forming a callus or covering over the end of each root that has been cut.

It is not desirable to prune back young trees immediately at the time of planting, but wait till early spring and then cut cleanly back to the dormant but plump eye from which a branch or leader is to be formed. If, on the other hand, the planting is not done till late in the spring, it is then far better to defer pruning the branches till early in the following winter or spring. When pruning the head of young standards it must be remembered that the formation of the tree is in the grower's hands, and if there are not sufficient branches they must be created by the judicious use of the knife. The treatment of the heads of different kinds of trees must to a certain extent be determined by the character of their growth, the aim being to obtain the formation of heads composed of branches that stand clear of each other, are well-balanced, and thoroughly exposed to light and sunshine. This is absolutely necessary for the ripening of the wood, for the formation of spurs with fruit buds, and last, but not least, for the maturing and colouring of the crop. If properly pruned and looked after for the first six years, a young cider orchard only requires to be gone over regularly each year for the purpose of removing any branches that are broken, injured by stock, or are interfering with an adjoining branch.

The Irish Department of Agriculture have arranged for young men who intend to become farmers and who desire to acquire a practical knowledge of the **Agricultural Education for Young Men in Ireland.** several branches of farming to be admitted to several of the Irish agricultural stations as apprentices.

The farming operations are conducted by an experienced agriculturist, under whose direction the apprentices are required to take part in all the work of the fields and of the farmyard. In the class-room, instruction is given in the evenings, and at other times when outdoor work is not pressing, in English, arithmetic (including surveying), bookkeeping and technical agriculture. This instruction is not intended as a preparation for any examination, but is of such a character as to continue the general education of the apprentices and be useful to them in their future careers as farmers. Each applicant must be not less than 17 years of age and must provide evidence of a sure prospect of obtaining a farm of his own or *bona fide* occupation on a farm. Admission is conditional on passing a simple entrance examination and producing certificates of good health and character. At one of the stations no fees are charged at present; at the other two the fees for apprentices whose parents or guardians derive their living mainly from farming in Ireland are proportional to the aggregate tenement valuation of their holdings and vary from £3 to £15. Other apprentices pay £20. The fees include board and residence for about eleven months.

Arrangements have also been made for the training of apprentices to the poultry-fattening industry. The apprentices will be instructed in the preparation of suitable foods, the fattening, cramming, killing, plucking and dressing of poultry for market, and the management of poultry generally. They are required to devote their whole time to the work. They must pass an elementary examination and be otherwise suitable. Successful candidates receive wages at the rate of 16s. a week, and are required to find their own board and lodgings.

The weather continued to be very fine and dry generally during the *first week* of July, though late in the week, mostly on Friday and Saturday, several parts of the country experienced thunderstorms and more or less rain.

Notes on the Weather in July.

The temperature was very generally above the average, though in England E. it was rather below; in Scotland N. and W. and in England N.W. and S.W. the warmth was classed as "very unusual," the thermometer registering 91° in Scotland W., 87° in England S.W., and 86° England N.W. and Scotland E. Bright sunshine was generally "abundant" and in some districts "very abundant."

Soon after the beginning of the *second week*, however, the weather became rainy and unsettled very generally. Thunder or thunderstorms were experienced in nearly all parts of England and Wales. The temperature consequently was below the average, though it was only recorded as "deficient" in three districts, viz., Scotland E., England N.E. and N.W.; elsewhere the warmth was "moderate." Rainfall exceeded the average except in Scotland N., the difference from the normal being large in almost all districts. Falls of half-an-inch or more were rather common, and about the middle of the week measurements of more than an inch were made in Wales, the largest being 1·6 in. at Aberdovey. In England N.W., however, the rainfall was "very scanty." Bright sunshine was naturally deficient, being generally returned as "scanty" or "very scanty."

This type of weather continued to prevail in the *third week*, cool and very unsettled conditions being experienced over the whole Kingdom. Except in the north of Scotland and the English Channel district, the rain was extremely heavy. Thunderstorms occurred in almost all localities, but were more common over the eastern half of England than elsewhere. Warmth was recorded as deficient everywhere except in England N.E., where it was "moderate." As a rule the nights were mild, and many of the minimum temperatures were above the normal. The rainfall greatly exceeded the average, and falls of an inch or more in one day were registered over a large portion of England, generally either early in the week or on Thursday. The largest quantities reported on the earlier days were 1·4 in. at Clacton, Felixstowe and Tunbridge Wells, 1·38 in. at Broadstairs, and 1·80 in. at Norwich; and on Thursday 1·37 in. at Clifton, 1·39 in. at Prestwich, and 2·02 in. at Arlington. The highest totals for the week were 3·3 in. at Felixstowe and 3·15 in. at Clacton. Bright sunshine was very deficient.

In the *fourth week* of July, ending on the 25th, however, the weather in England was generally very fine, almost the only rain falling over the northern and north-western districts on Saturday. Temperature was rather above the average over the Kingdom generally, but the warmth was only recorded as "unusual" in England N.E. and in the Midland Counties, being "moderate" elsewhere. Bright sunshine was "abundant" in the Midland Counties and the N.W. and S.W. of England, and "moderate" in other parts, except the North of Scotland, where it was "scanty."

In the *fifth week*, ending on the 1st August, the weather was generally fine, warm and dry. Moderate warmth was experienced in most parts, though it was "unusual" in England N.E., and in the Midland Counties. The rainfall was "light" or "very light," many stations in eastern, central and southern England reporting a continuance of the drought which commenced shortly after the middle of July. Bright sunshine was generally in excess of the average, being "very abundant" in England, N.E., E., S.E. and Midland Counties.

The Crop Estimators of the Board of Agriculture, reporting on the condition and prospects of the principal crops on 15th July, generally refer to the wet and cold condition of the soil in the beginning of the year, and the consequent difficulty of securing a good seed bed for the spring-sown crops. The drought and extreme heat of June were detrimental to the favourable growth of many crops, but the beneficial effects of the recent rainfall is generally noted.

Report on Crop Prospects in July.

The most promising of the cereal crops at present is wheat, as, although an under-average crop is indicated in the midland and northern counties and in Wales, an over-average crop is suggested in the north-western counties and Scotland, while in other parts of England it is about an average. Barley is placed below the average in the greater part of England and in Wales, but an average crop may perhaps be obtained in the north of England and in Scotland. Oats are also mostly below average in England and Wales, but an average crop is anticipated in the West of Scotland.

Potatoes and roots are very promising, and both may be expected, on present prospects, to give over-average results.

The yield of hay in England and Wales exceeds the average, and has generally been secured early under exceptionally favourable conditions, and at much less expense than last year. In Scotland the crop is under average, the clovers having failed in many counties.

As regards fruit, strawberries were an abundant crop generally. Bush fruit is reported as only fairly good, while not more than a moderate yield of plums and apples is anticipated.

Hops are reported as looking well; and as a rule to be so far free from vermin.

Labour is generally plentiful, the good weather for haymaking not having made a very large demand for hands. In some districts, however, the supply is said to be insufficient.

Summarising the reports, and representing an average crop by 100, the appearance of the crop in mid-July indicates yields for Great Britain which may be represented by the following percentages:—Wheat, 100; barley, 97; oats, 96; potatoes, 103; roots, 102; hay, 103.

Wheat Crop of the World.—A preliminary estimate of the wheat crop of the world, which appears in "Beerbohm's Corn Trade List" of 31st July, puts the total yield at 400,000,000 qrs. of 480 lb., compared with 393,225,000 qrs. last year, and 406,000,000 qrs. in the six years 1902-07.

Notes on Crop Prospects Abroad.

Germany.—According to the official report on the state of the crops in the middle of July, the weather in

Germany during the previous month was generally dry, but shortly before the date of the report heavy down-pours of rain and hailstorms occurred in many districts and did some damage. The average condition of all the crops, except winter spelt and potatoes, was somewhat less favourable than in June. The reports on the condition of winter grain crops, however, were on the whole not unfavourable, and the harvest prospects are quite satisfactory. The prospects for the spring grain crops are somewhat less favourable, though still satisfactory. Owing to the dryness these crops, and especially barley and oats, have not grown well, and are consequently short in the straw and light in the ear.

As regards potatoes, reports from different districts vary considerably. It was variously stated that the crop had come up irregularly with blanks, that the growth had suffered from the drought, and that cultivation of the crop had been rendered difficult owing to the hardness of the ground and the abundant weeds. Other reports, however, stated that potatoes in general were pretty good, or that the recent rains had already had a good effect on the growth. A thoroughly good growth, however, is only reported from Bavaria.

The arithmetical condition of the various crops was as follows:—Winter wheat, 2·3; spring wheat, 2·6; winter rye, 2·4; spring rye, 2·5; barley, 2·6; oats, 2·8; and potatoes, 2·7. The average condition in July during the past fifteen years, 1893-1907, has been as follows:—Winter wheat, 2·5; spring wheat, 2·6; winter rye, spring rye and barley, 2·5; oats, 2·7; and potatoes, 2·5 (1 = very good, 2 = good, 3 = medium (average), 4 = small).

Hungary.—The Hungarian Ministry of Agriculture, in the report on the condition of the crops on the 15th July, states that the weather in the first half of July was generally dry and hot, and materially hastened the harvest, which is now over. The yield appears to vary considerably, but until the trial threshings are finished it would be premature to make a definite statement. So far as has been ascertained, the yield of wheat is likely to be better than the previous estimate, but it is stated that it cannot, in general, be described as satisfactory. The yield of rye is likely to be below the average, but of medium quality. Winter barley is satisfactory, but summer barley below the average. The oat crop leaves much to be desired both as regards quantity and quality. Early potatoes have yielded few tubers, but the late sorts promise, with favourable weather, to give an abundant yield.

Norway.—The Board have received, through the Foreign Office, a despatch, dated 6th July, 1908, from Mr. F. E. Drummond Hay, H.M. Consul at Christiana, stating that the harvest prospects this year are fairly promising. The winter was comparatively mild nearly all over the country, and ploughing and sowing took place under favourable circumstances. The hay crops are promising in the south and west of the country and in some counties very promising. In the five northernmost counties an average crop is expected, in Tromsö county, perhaps, even a little above the average. A good deal of damage was done to the rye sown in the autumn, but the spring grain looks promising. Potatoes and turnips, satisfactory. The prospects for the fruit crops vary; in the south-west, from Jarlsberg and Larvik to South Bergenhus (Stavanger excluded), the yield is expected to be below the average, and small in Lister and Mandal.

Sweden.—According to a statement issued by the Swedish Board of Agriculture on 17th July showing the condition of the crops at the end of June, the average yield is estimated as follows:—Winter wheat, 4·0; winter rye, 3·6; barley, 3·7; oats, 3·7; mixed corn, 3·8; leguminous crops, 3·7; potatoes, 3·4; sugar-beet, 3·4; hay from pasture land, 4·3; and meadow hay, 4·0; (5 = very good, 4 = good, 3 = average, 2 = poor, 1 = very poor). H.M. Consul at Stockholm (Mr. M. Villiers) states that the spring sowings appear full of promise and are better than for many years. The average for the Kingdom is reckoned at 3·7 and 3·8 in recent official notes. The weather in July had not, up to the 17th, improved the harvest prospects. Industrial strikes will probably give farmers a better chance of engaging labourers, who are usually very scarce.

France.—H.M. Consul at Bordeaux, writing on 21st July, stated that owing to wet weather the wheat harvest was being gathered under unfavourable conditions. It is anticipated that the crop will be below the normal, the grain weighing 57 to 59 lb. per bushel. The stocks remaining over from the abundant harvest of 1907 may prove sufficient to meet this year's shortage.

Russia.—The Board have received through the Foreign Office a summary of a communication issued by the Russian Ministry of the Interior and published in the St. Petersburg press of 9th July. The statement is based on telegraphic reports received from the Governors of Provinces, Bourse Committees, Agricultural Societies, and Local Authorities. The total area intended in 1907 for winter sowing in the 87 Governments and Territories of the Empire (Finland, the Island of Sakhalin, and the Amur and Maritime Territories being excluded) was 86,292,000 acres and that actually sown was 74,653,000 acres. Of this area 56,623,000 acres, or about two-thirds, are in a good or satisfactory condition, the remainder being unsatisfactory, bad or worthless. Part of the latter area has been resown for the spring crop.

The area which it was proposed to devote to spring sowing in the 87 Governments and Territories was 149,819,000 acres and that actually under seed is 153,742,000 acres, of which 94,810,000 acres afford the prospect of a good or satisfactory harvest, whilst 14,990,000 acres will be unsatisfactory or bad. Abundant rain fell over most

of the country during the second and third weeks in June, and had a very beneficial effect, especially on the spring crops, but it is still too early to predict with any certainty what the harvest may be, except in the south.

As regards the crops in the Eastern half of South Russia, Mr. W. R. Martin, British Vice-Consul at Rostov-on-Don, writing on 22nd July, states that two-thirds of the sowings of winter wheat in the Don Territory, both in the districts of the upper and lower Don river, were lost by the severe frosts and other unfavourable circumstances. The remaining third of the whole area is ripening under favourable conditions and the grain will be of heavy weight. The spring sowings of hard wheat and barley in the districts of the lower Don promise to bear fair results. In the districts of the upper Don they have suffered from the drought and the result will be under average. On the Veronezh-Rostov line, the condition of the winter sowings is the same as on the Don. Of the spring sowings, barley, hard and Ghirka wheat are expected to give an average yield. In the North Caucasus, Stavropol Government and Kuban Territory, the uncompleted winter sowings and severe cold will result in a poor harvest. On the other hand, spring sowings and particularly barley are expected to give good results. In the districts bordering the Sea of Azov, the results of winter wheat are expected to be poor, but those of hard wheat and barley above the average.

A memorandum dated 24th July has also been received from Mr. C. S. Smith, the British Consul-General at Odessa, summarising a report in the Official Commercial Gazette, which states that in the west of South Russia the long-continued drought of the second half of May and first half of June did much harm both to the most promising spring crops and to the already poor and decimated winter crops. About the middle of June rain began to fall, at first in small quantities and along narrow belts of land, but later more copiously and wider spread, and made much of the spring crop resume its good appearance, and even the winter crops looked better. In nearly all cases the straw remained unusually short, but the ears filled well. In the east of South Russia, that is, along the middle and lower courses of the rivers Don and Volga, particularly the latter, a severe drought set in about the end of May and greatly injured the crops, which up till then had looked exceedingly well. Opinions differ widely as to the prospects. The only certainty seems to be that the area under corn is unusually patchy. It would seem that the present state can be shortly described thus:—Winter wheat, rather less than two-thirds of an average crop; grain of fair quality. Winter rye, slightly below the average crop; quality of grain satisfactory. Spring grain, somewhat above an average crop, with grain of fair quality. Maize reported to be very good.

Mr. Smith adds that when it is remembered that the area of this consular district is about five times that of England it would seem that such estimates are at the best only instructed guesses, and the present condition may be seriously modified before reaping.

As regards Siberia, the British Commercial Attaché for Russia states (*Board of Trade Journal*, 30th July) that according to a report in the Official Commercial Gazette (19th July) the prospects in Western Siberia, the chief grain-growing region, are excellent, promising a rich harvest if the conditions remain as favourable as hitherto.

Canada.—The High Commissioner for Canada has received from the Minister of the Interior at Ottawa a summary of a report on crops in Canada at the end of June, which is extracted from the first issue of a monthly publication prepared by the Dominion Census and Statistics Office. Wheat is reported with a high average standard of 84 as regards condition (100 representing the condition for a full crop); it is 75 in Quebec, 81 in Ontario and New Brunswick, 93 in Alberta, 97 in Saskatchewan and 97 in Manitoba. The increase in area over last year is 562,511 acres for Alberta, Saskatchewan and Manitoba, but there is a decrease of 19,018 acres in Ontario, Quebec and Prince Edward Island.

The statistics of crops for the Dominion, exclusive of British Columbia, are given in the following table :—

		Percentage of Standard Condition.	Acreage.	
			1908.	1907.
Wheat	...	84	6,610,000	6,066,400
Oats	...	90	7,941,300	7,405,500
Barley	...	83	1,741,800	1,736,800
Rye	...	82	109,500	109,100
Peas	...	82	413,100	403,500
Beans	...	74	60,200	65,400
Mixed grains	...	84	581,900	605,200
Hay and clover	...	87	8,211,200	7,726,300

United States.—The Crop Reporting Board of the Bureau of Statistics of the Department of Agriculture reports that preliminary returns show the acreage of maize planted to be about 102,996,000, which is about 1,000,000 acres more than the area planted last year. The average condition on 1st July was 82·8 as compared with 80·2 on the same date last year. The average condition of winter wheat on 1st July was 80·6 as compared with 86 in the previous month, and of spring wheat 89·4 as compared with 95. The average condition of oats was 85·7, of barley 85·2 and of rye 91·2.

The subsequent Report issued on 7th August states that preliminary returns indicate a winter wheat crop of 425,940,000 bushels or an average of 14·3 bushels per acre compared with 14·6 bushels last year. The conditions on 1st August of maize was 82·5, of spring wheat 80·7, of barley 83·1, of rye 88·3, and of oats 76·8.

South Australia.—The Board of Trade correspondent at Adelaide (Mr. J. Creswell) reports, under date of 25th June, that there is promise of an abundant harvest in South Australia, and another 21 million crop should be reaped. During May and June copious rains fell in all the agricultural districts, but the pastoral districts were not so highly favoured. It is anticipated, however, that the lambing will be fairly good, though perhaps hardly so good as last year. Hay and chaff still keep dear in price, at about £5 per ton (of 2,000 lb.). This is mainly due to the shortage of fodder in Victoria and New South Wales, to which places large quantities are still being exported. In addition, feed is not very plentiful, which also helps to keep up the price of fodder. (*Board of Trade Journal*, 30th July, 1908.)

The Board of Agriculture and Fisheries have been furnished by the Board of Trade with the following report, based on over 200 returns from correspondents in various districts on the demand for agricultural labour in July :—

Agricultural Labour in England during July.

Employment was regular in July, except that haymakers lost some time on account of rain towards the middle of the month. Haymaking and hoeing caused a good demand for extra labour, but the supply, on the whole, was quite sufficient.

Northern Counties.—Correspondents in *Northumberland*, *Durham*, *Cumberland* and *Westmorland* generally report full and regular employment during July; there was a good demand for day labourers on account of haymaking and turnip hoeing, and in several instances the supply was not equal to the demand. Employment was also reported as regular in *Lancashire*, with the supply of and demand for extra labour generally equal. Employment was generally regular in *Yorkshire*, though rain in the early part of the month caused some interruption to the employment of day labourers; in several districts there was a scarcity of men for haymaking.

Midland Counties.—Employment was generally regular in *Cheshire* and *Derbyshire*, the supply of extra labour being generally about equal to the demand. In the *Hayfield Union* (*Derbyshire*), however, a number of Irish migratory labourers were reported as in irregular work. The hay harvest and turnip hoeing generally caused a good demand for labour in *Nottinghamshire* and *Leicestershire*, and employment was regular and full, except for a little interruption from wet weather. There was little or no interruption to employment in *Staffordshire* and *Shropshire*, and in the latter county the demand for extra labour somewhat exceeded the supply. In *Worcestershire* and *Warwickshire* rain caused some interruption to employment about the middle of the month, otherwise haymaking and hoeing roots provided constant work for day labourers. Similar reports come from *Northamptonshire* and *Oxfordshire*. Employment was generally regular in *Buckinghamshire*, and the supply of labour about equal to the demand. Rain somewhat interfered with the employment of day labourers in *Hertfordshire* and *Bedfordshire*, but generally there was full employment in these counties at haymaking and hoeing.

Eastern Counties.—There was generally regular employment in *Huntingdonshire* and *Cambridgeshire*, and the supply of day labourers was usually sufficient. Haymaking, hoeing, pea-picking and other work occasioned a good and constant demand for extra labour in *Lincolnshire*, and in several districts the supply was reported as insufficient. In *Norfolk* and *Suffolk* rain somewhat interrupted haymaking in the middle of the month, but employment on the whole was regular, the supply of and demand for labour being about equal. Similar reports come from *Essex*.

Southern and South-Western Counties.—There was a fairly good demand for extra labour in *Kent*, but this was exceeded by the supply in several districts, while rain also occasioned some irregularity of employment for this class of labour. Haymaking and hoeing generally provided regular employment in *Surrey*. In *Sussex* and *Hampshire* the supply of labour was about equal to the demand. Farm work proceeded regularly, hoeing being carried on when the haymaking was interrupted by wet weather. Regularity of employment was reported from *Berkshire* and *Wiltshire*. In *Dorset* and *Somerset* the backward condition of the root crops was said to have somewhat diminished the employment of extra labour. Haymaking was interrupted for days by rain in *Herefordshire* and *Worcestershire*, but hoeing was proceeded with instead, and employment generally suffered little interruption. The supply of extra labour was about equal to the demand in *Devonshire* and *Cornwall*, but some scarcity of men for permanent situations was reported from both counties.

Decrease in Grain Shipments from New York.—The Board have received through the Foreign Office a despatch, dated 18th June, from Mr. Consul-General Bennett, drawing attention to the shrinkage in the grain exports from New York. It would appear that Canada is now getting the great bulk of the grain trade, Montreal having booked since the opening of navigation this year some 8,000,000 bushels, while New York has secured but little more than 2,000,000 bushels. The rate for water carriage from Duluth and Fort William to Montreal is now 3½ or 4 cents. per bushel less than from the same points *via* Buffalo to New York.

Importation of Dogs into French West Africa.—By a decree dated 29th May, 1908, dogs imported into French West Africa are required to be accompanied by a certificate from the authorities of the place of origin stating that no case of rabies has occurred in the district during the previous six months.

Purchase of British Cattle for Japan.—The Board understand that several Japanese buyers of cattle have recently visited this country, and they are informed by the Japanese Consul-General that Messrs. Nozawa and Co., Broad Street House, New Broad Street, London, E.C., act as intermediaries for Japanese buyers over here.

Rabies in the United States.—In a Circular (No. 129), issued by the Bureau of Animal Industry, United States Department of Agriculture, on "Rabies and its Increasing Prevalence"; it is stated that rabies is "constantly spreading and causing increased financial loss, human suffering and death year by year. There is abundant evidence to warrant the statement that not a single State is free from the disease." The remedy suggested is the muzzling of dogs, but this requires legislation on the part of each of the separate States, and at the present time there are many obstacles to be overcome before this can be secured.

Reference is made in the course of the bulletin to the diagnosis of the disease by laboratory methods, and the method of post-mortem examination is described. Until recent years the only method of diagnosis was by the inoculation of rabbits, but inoculation is not now resorted to in the Laboratory of the Bureau, if the so-called "Negri bodies" are found. In 1903, Negri, of the University of Pavia, Italy, published the results of his researches and claimed to have found the causative agent of the disease, which consisted of cell inclusions, now known as Negri bodies, in the large nerve cells. The relation which these bodies bear to rabies has since been confirmed by many investigators, and they are at present considered pathognomonic of the disease. Whether or not they are the real etiological factor in the production of rabies still remains to be proved.

Berlin Hop and Barley Exhibition.—The Institute for Experimental Research in Brewing (*Versuchs-und Lehranstalt für Brauerei*) will hold an International Exhibition at Berlin from the 10th to 18th October next. All samples of barley and hops must form part of the 1908 crop, and must be certified to have been grown by the exhibitor himself. The entrance fee for each sample is 2s., which must be sent with a notice of entry on the proper form so as to reach the Exhibition Committee by the 17th September at the latest. The regulations state that each sample of barley sent in must weigh at least 30 kilos. (66*1*/₄ lb.), and of hops at least 4 kilos. (nearly 9 lb.). The entry form, however, gives the weight of the samples as 50 kilos. (110 lb.) to be accompanied by specimens of ears corresponding to the sample. The barley samples must not be hand-picked, but machine sorted in the usual way, nor may they be sulphured or otherwise preserved, hop samples must not be sulphured or otherwise preserved, except in the case of samples sent by sea, i.e., from America or the United Kingdom, when the fact must be expressly stated. An exhibitor can enter several samples of barley or hops provided they clearly differ as regards variety, growth and treatment. Collections of samples from growers or from societies, and exhibits showing experiments in cultivation, may be shown, but not entered for competition. All exhibits must be delivered by 26th September.

An exhibition of brewing plant and of dray-horses will take place at the same time.

All communications should be addressed to the "Verein Versuchs-und Lehranstalt für Brauerei, Institut für Gärungsgewerbe," Seestrasse, Berlin, N. 65. Copies of the regulations and other particulars can be obtained from the Offices of the Board, 8, Whitehall Place, S.W.

Scottish Agricultural Organisation Society.—This society has been formed on similar lines to the English Agricultural Organisation Society, to develop the organisation of agriculture in Scotland through the co-operative purchase of requirements, and the manufacture and sale of the products of agriculture. It does not engage in

trade, but is intended to foster the formation of trading associations and to popularize and to advocate the idea of a better organisation of the manufacturing and commercial side of agricultural work. Leaving to other agencies the furthering of other agricultural interests, it concentrates its efforts on the development and application of the principle of combined action in agriculture. During the two years it has been in existence 17 local societies have been formed, three of which are dairy associations.

Six Months' Egg-Laying Competition.—The Street and District Collecting Dépôt proposes to hold a six months' laying competition from 1st October, 1908, to 31st March, 1909. The pens admitted to the competition will consist of six pullets of one breed, hatched not earlier than January last, and the pen producing the greatest value in eggs during the six months will be adjudged the winner. The eggs will be valued at certain fixed prices per dozen, varying according to season; all eggs will be weighed, and each $\frac{1}{2}$ lb. will be calculated as one dozen. Each pen will be housed in a separate scratching shed, and will have a grass run not less than 120 square yards.

Agricultural Machinery in Russia.—The acting British Consul at St. Petersburg (Mr. C. H. Mackie), reporting on the agricultural machinery trade in Russia, states that the provincial associations for the co-operative purchase and sale of agricultural machinery and implements are continuing to extend their operations, and that German manufacturers and British firms, the latter to a less degree, have been able to secure a fair amount of business. The total amount of such machinery and implements imported into Russia in 1907 from all countries amounted to £1,835,368, an increase of £197,158 over that of 1906. The imports from Germany during the same period amounted to £672,637, or over one-third of the whole trade, and were, moreover, in excess of the imports from that country in 1906 by £208,532. The imports from the United Kingdom amounted to £240,947, an increase over those of the previous year of £63,684. It is gratifying to see from the latter figures, remarks Mr. Mackie, that British manufacturers of this class of machinery have not neglected the Russian market, and it is to be hoped that with increased activity they will further extend their business, as the superiority of British makes is fully appreciated throughout that country. It should be borne in mind by British manufacturers that many kinds of agricultural machinery are exempt from import duty in Russia. (*Board of Trade Journal*, 16th July, 1908.)

Destruction of Rats.—In order to obtain accurate information regarding the nature and extent of the damage done by rats within the United Kingdom, the Incorporated Society for the Destruction of Vermin have prepared a schedule of questions which they desire to place into the hands of all those who are in a position, from their own experience, to give information concerning temporary or permanent rat plagues in their districts, the damage inflicted by rats, the steps taken by them—individually or in co-operation with others—for preventing such damage, the means chosen for that purpose, and the results obtained. The Committee of the Society hope that those interested will apply for a copy of the schedule, which may be obtained from the Secretary of the Society, 95, Wigmore Street, London, W.

International Congress on Refrigeration.—An International Congress of the Cold Storage Industry will be held at Paris from the 5th to 10th October next, under the patronage of the French Minister of Agriculture and other members of the Cabinet. A grant of £1,600 has been made by the French Government for the organization of this Congress. The programme deals with the following points: (1) Low temperatures and their effects, hygiene, &c.; (2) Cold storage machinery; (3) Application of cold storage to food products; (4) Refrigeration, &c., in other industries; (5) Refrigeration applied to the transport of food, &c.; (6) Legislation. The subscription to the Congress is fixed at 20 francs.

Agricultural Organisation Society.—The Annual Report of the Agricultural Organisation Society for the year 1907 showed that the number of affiliated societies increased from 137 at the end of 1906 to 167 at the end of 1907, while the membership increased from 8,700 to 10,500. A very marked increase took place in the business done by the societies, the aggregate turnover having risen from £375,000 in

1906 to £610,000 in 1907. This great development is chiefly accounted for by the societies which supply agricultural requirements. The societies are classified in the Report as follows:—Societies for the supply of requirements or sale of produce, 114; dairy societies, 11; credit societies, 15; small holding and allotment societies, 13; miscellaneous societies, 12; together with two federations. Many of the societies, however, engage in more than one kind of business. The sale of live stock is undertaken by some of the societies, and forms an important item in their work. For instance, the Winchester Agricultural Trading Society in 1907, the first year of its existence, sold stock to the value of £24,000, while the sales of pigs by the Eastern Counties Farmers' Co-operative Association accounted for £64,000 out of a total turn-over of £177,000. Some of the dairy societies managed to pay high prices to their members for milk. The Nidderdale Dairy Society paid 8½d. a gallon during eleven months of the year, and the Walkden Farmers' Milk Supply Association paid 2s. 3d. and 2s. 4d. per 32½ lb.

The Report refers to the effect of the Small Holdings and Allotments Act on the co-operative movement, and the additional work thrown on the Society by the formation of small holding and allotment societies. It is pointed out that there is urgent need that the subscriptions should not only be maintained at their present figure, but should be substantially increased. During the year, however, the subscriptions declined from £1,441 in 1906 to £1,199 in 1907.

Production of Certified Milk in the United States.—With a view to an improvement in the quality of milk, a few Associations, usually composed of medical men, have been formed in the United States to supervise and control its production. These "milk commissions," as they are called, arrange with dairymen for the production of milk under the highest sanitary conditions, and, by inspection and examination of the milk, endeavour to ensure that the conditions are carried out. The dairyman, on his part, is authorised to sell the milk as "certified," and is thus able to obtain a considerably higher price for it. An account of the work of these Medical Milk Commissions, and of the method of producing "certified milk" is given in Bulletin 104, published by the Bureau of Animal Industry. The greatest cleanliness is observed throughout, and the bacteria in such milk seldom exceed 30,000 to the cubic centimetre, and in most instances average less than 10,000. From this cause it will keep sweet a long time, and is specially valuable as a food for infants or invalids.

American Gooseberry Mildew in Germany.—The Board have received, through the Foreign Office, a despatch from H.M. Consul at Stettin stating that American Gooseberry Mildew has appeared at three places in Pomerania. The disease is said to have entered Germany from Russia, and it has spread rapidly. In 1906, 25 villages were affected in East Prussia, and in 1907 the number had risen to 195. In West Prussia 94 villages, and in Posen 255 villages, were affected in 1907. According to the latest reports, the disease has reached Silesia, Brandenburg, Mecklenburg, Schleswig-Holstein, and is constantly spreading in a westerly direction.

Prussian Gardening School at Dahlem.—The Royal Gardening School at Dahlem, near Steglitz, Berlin, provides four courses of instruction of one year each. The first year's course embraces general subjects such as botany, chemistry, zoology, and the principles of gardening, fruit culture, etc. Attendance at this course is obligatory, unless applicants can show that they have attained the required standard of knowledge by attendance at other gardening schools or elsewhere. The other three courses include (1) gardening, (2) fruit culture, and (3) plant cultivation, any one of which may be selected. Foreigners are admitted at fees varying from £17 10s. to £20 per annum, exclusive of board and lodging which must be provided by the student. The Institute is very completely provided with laboratories and glasshouses and possesses grounds covering twenty acres. The next course commences on the 1st of October.

Deformed Roses.—The Board received from Norwich some specimens of rose buds which had every appearance of being diseased. On examination it was found that the carpels or fruit-forming portions of the flower had degenerated into green leaf-like

structures. This is the first condition of a change to the "green rose" monstrosity, when all the parts of the flower become green.

The cause of this condition is not known, but when a plant once shows a tendency to produce morbid flowers, it usually proceeds more and more in that direction. It is therefore advisable that such deformed types should be rooted up and burned.

Fruit Trees damaged by Frost.—Specimens of cuttings from cherry trees from Suckley (Worcs.), were found to have been killed by frost, while apple shoots, &c., from Tiverton and Brixham (Devon), were also primarily injured by frost, certain fungi being present only as secondary agents. The mildness of the past few autumns has allowed a continuance of growth up to the time of appearance of frost, the result being that the imperfectly matured wood has in some cases suffered.

Analyses at the Government Laboratory.—The number of samples examined at the Government Laboratory for the Board of Agriculture and Fisheries in the year ended 31st March, 1908, was 2,303 as compared with 2,429 in the previous year, and of these 1,992 were samples of butter, margarine, cheese, &c., taken at the ports by Customs officers. The principal chemist of the Government Laboratory (Dr. Thorpe), in his annual report,* states that there has been a reduction in the number of samples of imported butter taken during the year owing to the fact that the receipts of butter from places concerned in its adulteration has largely diminished, owing doubtless to the prosecutions undertaken by the Customs. Importers in this country are exercising care to obtain butter from sources that can be relied on, since the onus of defending a prosecution falls on the importer, and not on the foreign exporter. During the year 1907-8 none of the samples has afforded conclusive evidence of adulteration with foreign fat, and in only a few cases has the butter been of a suspicious character. Dr. Thorpe remarks that butter of the character of the samples concerning which legal proceedings were taken in 1905 and 1906 entirely disappeared in the past year. There has also been a reduction in the number of samples found to contain water in excess of the legal limit.

Besides the samples of imported produce, numerous other samples were analysed for the Board at the Government Laboratory, as well as eighty-two samples referred by magistrates under the Food and Drugs Act, and five samples referred by the Board under the Fertilisers and Feeding Stuffs Act, 1906.

Departmental Committee on the Meat Supply.—The President of the Board of Trade has appointed Lord Robert Cecil, K.C., M.P. (Chairman); Mr. C. W. Bowerman, M.P.; Sir T. H. Elliott, K.C.B.; Mr. W. Field, M.P.; Mr. H. Fountain; Mr. W. Dudley Ward, M.P.; and Mr. William Weddel, to be a Committee to inquire how far and in what manner the general supply, distribution and price of meat in the United Kingdom are controlled or affected by any combination of firms or companies. Mr. P. Ashley, of the Board of Trade, will act as Secretary to the Committee.

Disinfection of Hides Imported into the United States.—With reference to the revised regulations, given in this *Journal*, April, 1907, p. 66, the Board are now informed that the United States Treasury Department have requested the Department of State to instruct American Consular officers to refuse to certify invoices covering hides for shipment to the United States when it is known to the Consular officers that anthrax is prevalent in their respective Consular districts, unless such hides be disinfected prior to shipment by immersion for thirty minutes in a solution of bichloride of mercury (1 in 1,000), such instructions to apply to all hides of neat cattle, including those which have been dry-salted or arsenic-cured, but should have no application to hides shipped from districts other than those in which anthrax is known to be prevalent.

* Cd. 4157. Price 3d.

OFFICIAL CIRCULARS AND NOTICES.

The Board have addressed the following Circular, dated the 30th June, 1908, to County Councils and County Boroughs in England and Wales on the subject of
Valuation of Land fees payable for the valuation of land in under the connection with the Small Holdings Act :—
Small Holdings Act.

SIR,

I am directed by the Board of Agriculture and Fisheries to advert to their Circular Letter of the 24th April last (A. 165/C), and to say that they have had under consideration the question of the fees payable by Councils to valuers who are instructed to prepare a report and valuation in respect of land, the acquisition of which for small holdings is under consideration.

In view of the fact that such fees may be repaid by the Board out of the Small Holdings Account under Section 17 of the Act of 1907 and the Regulations made thereunder, the Board think that it will be of assistance to your Council that they should indicate what are the fees which, in the opinion of the Board, may reasonably be allowed for the work in question.

The Board desire me, therefore, to say that they are of opinion that the fees to be paid to valuers for a report on and a valuation of land for small holdings should not exceed 1s. per acre for the first hundred acres and 6d. per acre above that quantity, with a minimum fee of £3 3s., together with reasonable travelling and out-of-pocket expenses. So far as plans are concerned, the Board think that it will be sufficient to mark the property on a 25-inch Ordnance Survey map and that no special survey will be necessary.

The Board will be prepared to repay valuers' fees on this basis, but I am to add that, in the case of arrangements which have been entered into before the receipt of this circular, they will be ready to consider on their merits applications for the repayment of charges paid to valuers on a different basis.

I am, &c.,

T. H. ELLIOTT,

Secretary.

The Board have issued the following Circular letter, dated 15th July, 1908, to Local Authorities in Great Britain under the Diseases of Animals Acts :—

Anthrax in Sheep. SIR,

I am directed by the Board of Agriculture and Fisheries to inform you that they have reason to fear that the disease of Anthrax in animals is frequently spread by means of sheep which die of the disease without its being reported to the police by the owner, as required by the Anthrax Order of 1899, and they are desirous of ascertaining as far as possible to what extent, if any, such unreported cases of Anthrax in sheep occur. With this object in view, I am to suggest that your Local Authority might issue a short leaflet to the sheep farmers in their district, inviting them to co-operate with your Local Authority in the endeavour to check the spread of Anthrax, by bringing to their notice all cases of sudden and suspicious deaths amongst their sheep, in order that your Local Authority may be in a position to determine, by means of a veterinary examination of the carcases, whether or not the animals have died of that disease. The Board would be happy to arrange for their Veterinary Officers to render your Local Authority every possible assistance in the matter of diagnosis, by examining slides containing specimens

of the blood of suspected sheep, or the tissues from the carcases, which may be referred to them by the Veterinary Inspectors of your Local Authority.

The Board would be glad to be informed whether your Local Authority can see their way to adopt this suggestion.

I am, &c.,

T. H. ELLIOTT,

Secretary.

In consequence of the discovery of American Gooseberry Mildew in Kent, the Board of Agriculture and Fisheries have made an Order which came into operation on the 18th of July, 1908, and applied to the County of Kent, the county borough of Canterbury, and the boroughs of Gillingham and Maidstone. The Order follows the lines of the Orders applied to other counties where American Gooseberry Mildew has appeared, of which a summary was given in this *Journal*, January, 1908, p. 624.

The American Gooseberry Mildew (Kent)

Order of 1908.

The Board of Agriculture and Fisheries desire to draw the attention of gooseberry growers to the fact that American Gooseberry Mildew is now appearing in many fresh districts in Kent. Growers are urged to keep their bushes under close observation, as the discovery of the disease in its early stages avoids much trouble and expense.

American Gooseberry Mildew in Kent.

In a number of cases it has appeared round packing sheds and places where returned empty boxes and baskets have been unloaded or have lain for a time. Such places should be kept constantly under observation, and rank-growing and succulent shoots in such situations should be examined. The disease appears first as a white growth on the stem, afterwards changing to brown, while the under-surfaces of the leaves appear as if dusted with flour. Such leaves will often curl up and show the white under-surfaces. All cases of disease in Kent should be at once reported to the Clerk of the County Council for Kent, Maidstone, or to the Secretary to the Board of Agriculture, 4, Whitehall Place, London, S.W. As a precaution against the disease, the gooseberry bushes around packing sheds should be sprayed with a solution made by dissolving 1 pound of liver of sulphur in 32 gallons of water. If any signs of disease are discovered, the diseased bushes, and bushes in contact with them, should at once be destroyed.

REVIEW OF MARKET PRICES IN JULY.

A. T. MATTHEWS.

First Week.—The first full market day at Islington fell on the 6th, the Thursday's business having become so small that little account is now taken of it. There were 760 fat cattle on offer against 960 the previous Monday and 750 on the corresponding day last year. The average quality of the animals was fair, some excellent grass-fed Herefords being on offer as well as some very good Shorthorns. Amongst the latter, however, were many that would have been all the better for another month's feeding and would probably have paid the senders better if they had received it. The best Herefords made 7d. per lb., as did also the Shorthorns, but of the latter there were comparatively few which made over 6½d. A large number did

not exceed 6½d. and some of those in poor condition went for still less money. The trade in the country was weaker for beef on the whole, but the movement was not uniformly downwards, a few even recording an advance amongst these being Leeds, Leicester, York, Wolverhampton, Glasgow, Dundee, Inverness and Stirling. Quite double the number of the above showed a decline, including Ashford, Derby, Peterborough, Salford and Shrewsbury. The trade for fat sheep in London on the 6th was again remarkably dull. More than half the supply of 6,620 was composed of those which had been left over from the previous week and again a clearance was found to be impossible. For this to happen two weeks in succession is a rare occurrence in the London market. Under these circumstances, needless to say, prices were lower. The nominal quotation was a decline of ¼d. per lb., but there is no doubt that larger concessions would have been made for the heavier sheep had offers been forthcoming, both farmers and salesmen strongly objecting to holding over if it can possibly be helped. The top price of Down tegs weighing about 70 lbs. was 7½d. per lb. and that of heavy sheep as low as 7½d., while 88-lb. Romney Marsh wethers were quite unsaleable. It may be worthy of note that at the corresponding market last year, with a larger supply by about 3,000, the prices were 1½d. per lb. higher, or no less than 9s. per head on 72-lb. sheep. At the majority of the country markets matters were not nearly so bad as in London, for although the demand was dull, it was only at a small minority that values were actually lower, while at five or six there was even a slight improvement. In actual values the following markets were quoted higher than in London for best Down sheep:—Dorchester, Shrewsbury, Ruthin, Derby, Leicester, Peterborough, Salford, Newcastle, Wolverhampton and Crewe. It will thus be seen that London was exceptionally depressed, a state of things which may be partially accounted for by the average weight of the sheep sent to London at this time of year being too large for butchers' requirements. In this connection, it is worth mentioning that small Scotch half-breds realized 8½d. per lb. against 7½d. for prime English Downs. The reason given by butchers for this preference is not because of superiority in texture or flavour but solely on account of the smallness of the joints.

With the commencement of July, the inflated prices for American chilled beef which had been reached in June, rapidly gave way, falling, for best hind quarters, no less than 2d. per lb. from the highest point. On the 6th the price touched 6d. per lb., which is about its normal level, the decline being much larger in London than at the provincial markets. No other class of beef participated in either the rise or fall to anything like the extent of American chilled. English sides touched 6½d. on June 25th and had fallen to 6½d. by July 6th, the movements in Deptford-killed being somewhat similar, New Zealand frozen beef, which had advanced about ¼d. per lb. on its usual price, falling only about ½d.

The decline in fresh mutton during the first week was ½d. per lb., but frozen was practically unchanged. Fresh lamb sold badly, 9d. per lb. being its extreme value, and veal also was at least ¼d. per lb. lower.

Second Week.—The most striking feature of Islington Market was the falling off in the supplies both of cattle and sheep, compared with the previous week and the corresponding day last year. The weather was very wet and the attendance poor, yet prices were firm for cattle. Shorthorns realized up to 7d. per lb., Herefords, 7d., and Devons, 7½d. The tendency of

country markets during the week was decidedly upwards for beef, the following quoting higher prices :—Darlington, Hull, Leicester, Peterborough, Shrewsbury, Ayr, Dundee, Aberdeen, Edinburgh, Glasgow, Inverness and Stirling, the sharpest advance being made in Scotland. Against these, lower prices were recorded at Norwich, Liverpool, Crewe, Leeds and York, the latter falling 1s. 3d. per live cwt. for first quality. It was generally thought that there would have been a slight rally in sheep at Islington on the 13th if the weather had been propitious, but the rain not only kept away buyers, but the drenching of the wool was much against the appearance of the sheep. As it was, a clearance, for the first time in three weeks, was made, and prices were fully maintained, Scotch half-breds realizing up to 8½d. per lb. The large majority of the country markets were more or less firm, with certainly a better general tone. Darlington, Derby, Shrewsbury, Ipswich, Dundee and Glasgow were a little higher, while Carlisle and Castle Douglas quoted a reduction. London was one of the lowest markets, higher prices for first quality Downs being paid at Chichester, Dorchester, Bristol, Shrewsbury, Derby, Leicester, Peterborough, Salford, Liverpool, Newcastle, Wolverhampton and Crewe, being lower only at Wakefield and York. It is seldom that London has to take such a low place in the list of prices for best mutton. The country trade for lambs was also considerably better than in London. The latter was also one of the lowest markets for veal calves.

The Smithfield Market for dead-meat was firm for Scotch and English sides, Scotch short sides fetching 7½d. per lb., long sides 6¾d., English 6½d., and Deptford-killed 6½d. It frequently happens that Deptford-killed beef makes a little more in Smithfield Market than English, and this seems to call for some explanation. It seems that the demand for all meat in the London Central and Leadenhall Markets runs very much in grooves. Generally speaking, retailers have got into the way of dealing in certain classes, and for some years the supply of port-killed (or town-killed, as it is called) from Deptford has been regular and of excellent appearance, if not quite equal to English in flavour. This regularity has attracted and retains a certain number of buyers, few of whom will leave it on account of a temporary scarceness and some slight rise in price. It is the same thing all through the trade, and the recent extraordinary advance in American chilled is a good illustration of a common occurrence. By watching the markets, it will be seen that English beef is sometimes worth a little more than Deptford-killed, although the latter is generally shown in better condition. In other words, prices are ruled more by the fluctuations of supply than by relative quality and flavour.

Carcase mutton, both fresh and frozen, maintained its value at the decline of the previous week. Small Scotch fetched 5s. 2d. and English 4s. 8d. per 8 lb. stone. English lamb was cheap, the best not exceeding 5s. 8d., but some prime small Scotch began to arrive, and this was worth 6s. 8d. and even 7s. in some cases. There was no change in veal or pork, but the trade in both was very quiet.

Third Week.—There was a remarkably small market at Islington on the 20th instant, there being only 580 fat cattle on offer, so small a number being almost unprecedented except on a Bank Holiday. Under these circumstances, it was not surprising that prices should advance ½d. per lb., but this movement was more or less general during the following three days. The weekly official report of market prices (on which, together with the writer's own observa-

tions, these reviews are based) stated that: "Trade has been good, and prices have again reached a high level, especially in Scotland, where as much as 43s. 9d. per live cwt. was realized for prime Black Polled bullocks, while inferior qualities also show an advance in price."

The paucity of the sheep supply was also very marked, this being attributed to the fact that so many sheep were being dipped. The 3,790 on offer sold much better than of late. The best light-weight Downs advanced $\frac{1}{2}d.$ per lb., that is, from 7 $\frac{1}{2}d.$ to 8 $\frac{1}{2}d.$, bringing the London quotation for this class of sheep up to the level of those country markets which had recently been considerably higher. Scotch Cross-breds made 8 $\frac{1}{2}d.$, and English Cross-breds 8 $\frac{1}{2}d.$ for handy-sized sheep. Heavy Long-wools again met with scarcely any demand, and Kents were only worth 7d. per lb. for 80 to 90 lb. wethers. Lambs shared in the advance to the extent of $\frac{1}{2}d.$ per lb., the top price being 9 $\frac{1}{2}d.$. The trade in the country markets was very firm, and where there was any change in values for sheep it was generally in sellers' favour. The dearest markets of the week for sheep were London, Dorchester, Derby, Leicester, Peterborough, and Newcastle, at all of which places the price of first quality Downs was uniformly 8 $\frac{1}{2}d.$ per lb.

In the London dead-meat market the supply of beef was again very small, and in spite of an equally small demand, prices advanced slightly. There were some very fine sides from the Norfolk marshes, but only a small number from Scotland. The price of the best Deptford was, however, $\frac{1}{2}d.$ higher than English first quality. Scotch sides sold at 7d. per lb., English 6 $\frac{1}{2}d.$, and Deptford-killed 6 $\frac{1}{2}d.$. American chilled hind-quarters advanced to 6 $\frac{1}{2}d.$, the best New Zealand frozen fetching 4 $\frac{1}{2}d.$ and 3d. for hind and fore quarters. All fresh mutton was dearer on the week. Scotch and English by $\frac{1}{2}d.$, and Dutch by $\frac{1}{2}d.$ per lb. Lamb, however, was very slow, and the very choicest small Scotch being only worth 9 $\frac{1}{2}d.$ per lb. There was no change worth recording in frozen mutton and lamb, but veal, both English and Dutch, sold very slowly, the latter declining $\frac{1}{2}d.$ per lb. British veal was much dearer in Manchester and Liverpool than in London, the prices for first quality being 6s. 8d. per cwt. in London, 6s. 4d. in Manchester and Leeds, and 6s. 8d. in Liverpool. It should be noted that the trade in British veal in London is very small, the bulk of the supply coming from Holland. The very best small Dutch calves often fetch more than the English, but there is a very wide range in the quality of the former and the average price of all qualities would be less than that of English.

Fourth Week.—The last London Cattle Market fell on the 27th, and supplies were considerably larger, there being an increase of 250 head of cattle and 1,820 sheep over the previous week. Prices were, however, well maintained at last quotations, except that fat cows sold at $\frac{1}{2}d.$ per lb. cheaper. The general quality showed some falling-off, there being a larger proportion of unfinished cattle. The sheep trade was firm, though the character of those on offer was very various. The quotation for Longwools was higher on account of the arrival of a number of Irish of more handy weights than the Kents. The lamb trade was fair at 9 $\frac{1}{2}d.$ to 9d. per lb. During the last days of the month, beef declined somewhat at Smithfield dead-meat market, except for port-killed, which was scarce and dearer, Deptford-killed fetching 6 $\frac{1}{2}d.$ for best States, and 5 $\frac{1}{2}d.$ for Canadian "Ranchers," while the best English realised 6 $\frac{1}{2}d.$ and Scotch, 6 $\frac{1}{2}d.$ per lb. There was a fuller supply of chilled American, which declined to 4s. 2d. for hindquarters. Mutton was firm all round, but fresh lamb declined fully $\frac{1}{2}d.$ per lb. and veal remained unchanged at 6 $\frac{1}{2}d.$ per lb.

The trade for store stock during the month was much influenced by the weather, which was very dry at the beginning, grass became short and the root crop was threatened at a critical period. There has been little doing in cattle, but some sheep fairs have been held, at which the prices realized fell short of those of last year. At Dorchester, on the 6th, 12,752 were penned, and Downs declined 2s. to 3s., and Dorset Horns, 10s. to 12s. per head from last year's figures. At Shrewsbury, on the 10th, at a special sale of 934 cattle, prices declined £2 per head from the May sales. The fine rains which subsequently fell refreshed the pastures and saved the root crops, the demand for stores consequently improving during the latter half of the month. Dairy cows have been an irregular trade, but on the whole, there being no scarcity of milk, demand has not been very keen. Good cows, however, have been very saleable if showing a fair promise of yield.

Wool Prices.—The official report of the wool fairs, held in the south, up to the 8th, gave a more cheerful account than was expected. At Reading, Blandford, Dorchester, Chichester, Alton, Basingstoke, and Winchester there were plenty of buyers, and biddings were brisk up to 12½d. for Southdown teg wool at Chichester and 12½d. for ewe. At Alton the wool offered was chiefly Hampshire, the prices for which were 3d. per lb. lower than last year. At Swindon, on the 9th, Hampshire ewe made 10½d. to 11½d. for washed and 7d. to 8d. for unwashed. Unwashed teg, 6½d. per lb. The sales during the following week at Salisbury, Devizes, Wallingford, &c., again passed off with good spirit at very similar prices. The cheerful tone of the London sales influenced Bradford where prices were firm. At Lewes, on the 17th, prices were well maintained. The July series of London sales are not yet closed, and there have been fluctuations, but on the whole, although there is an absence of speculation, consumptive demand has been good, and the drop on this year's clip has not been so disastrous as it was feared would be the case.

REVIEW OF THE PROVISION TRADE IN JULY.

HEDLEY STEVENS.

Bacon.—At the commencement of the month the demand much improved, and prices steadily advanced, especially for side meats. By the middle of the month the prices for Canadian sides approached those of English and Irish, and were about 2s. above the current price at the same time last year. The arrivals continued to be small, although showing a slight increase on the June importations. The arrivals of Danish were not so heavy, being under 5,000 bales more than in July, 1907, with prices ranging from 2s. to 5s. per cwt. over those obtainable during the corresponding period last year. The Franco-British Exhibition in London has, it is believed, helped to keep up the prices of all provisions, by causing an additional demand. This applies especially to mild Danish bacon, the sales of which have to be forced should the consumptive demand be small, as it cannot be held over during the hot weather.

With the favourable weather conditions, there was a much improved demand for hams during the whole of the month, and prices steadily advanced, in some cases showing a rise of from 3s. to 6s. per cwt., though

the quotations are 5s. and more below what was realized in June, 1907. This has resulted in a loss to those who made contracts on the basis of the previous extreme prices.

Advices from America report good demand for all hog products, at higher prices than are obtainable in England, so that, apart from shipments to fill contracts, arrivals have been small.

The demand for English bacon was good, and, although dear, it is relatively cheap in comparison with imported goods. There are not enough bacon pigs to supply the demand, but a good many young pigs are reported in the country, and unless the high price of meal forces them on the market as porkers, there should be a better supply during the coming winter.

Cheese.—Canadian cheese has shown a smart advance during the month, and present prices are considerably above the normal. For the first ten days the spot demand was very quiet, and merchants were afraid to import at the prices then asked by Canadian shippers. By the third week the demand had much improved, and at the end of the month importers paid 3s. to 4s. advance. The make of Canadian is generally reported to be about 10 per cent. less than last year, chiefly on account of the extremely dry weather in the principal cheese-making districts during June and July. The weather has since improved, but it is feared that it is too late to replace any of the shrinkage. The quality is generally good, but much immature cheese is reaching this side, the Canadian farmer being doubtless eager to put his goods on the market at such remunerative prices.

There is a large make of cheese in progress in this country, especially in the Cheshire and Lancashire districts and in Scotland, but in some parts of the South and West of England there is possibly less on account of the dry weather, and also because farmers have been making such good prices for their milk for drinking purposes. The demand from London-alone is unusually large. Prices for English cheese ranged from 2s. to 4s. below, and Canadian 1s. to 3s. above those current last year.

Butter.—As was anticipated, prices of all kinds continued to advance and showed during the month a premium of from 12s. to 18s. per cwt. over July, 1907. On account of these abnormally high prices, buyers operated only from hand to mouth. The arrivals of Siberian have been very large, over 25,500 cwt. casks being delivered in London in one week. Canada has shipped 46,552 packages between May 1st and July 18th, as against 15,369 for the same period in 1907.

The large number of daily visitors to the Exhibition results in a largely increased consumption of butter in London, and it is anticipated by a good many in the trade that abnormally high prices will be experienced throughout the season.

Eggs.—The demand during nearly the whole of the month has kept exceptionally good, and prevented any accumulation of stock. In consequence prices have been maintained at a higher level than usual at this time of year. The warmer weather at the end of the month affected the consumption to a small extent.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND
in the Month of July, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—				
Cattle :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Poiled Scots ...	8 3	7 11	39 5	36 6
Herefords ...	8 4	7 11	—	—
Shorthorns ...	8 2	7 5	38 6	35 8
Devons ...	8 6	7 9	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
Veal Calves ...	7 $\frac{1}{2}$	7	8 $\frac{1}{2}$	6 $\frac{1}{2}$
Sheep :—				
Downs ...	8 $\frac{1}{2}$	7 $\frac{1}{2}$	—	—
Longwools ...	7 $\frac{1}{2}$	6 $\frac{1}{2}$	—	—
Cheviots ...	8 $\frac{1}{2}$	8	8 $\frac{1}{2}$	7 $\frac{1}{2}$
Blackfaced ...	8	7 $\frac{1}{2}$	8 $\frac{1}{2}$	7 $\frac{1}{2}$
Cross-breds ...	8	7 $\frac{1}{2}$	8 $\frac{1}{2}$	7 $\frac{1}{2}$
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs ...	6 0	5 6	6 0	5 3
Porkers ...	6 4	5 11	6 3	5 6
LEAN STOCK :—				
Milking Cows :—	per head.	per head.	per head.	per head.
Shorthorns—In Milk ...	£ s.	£ s.	£ s.	£ s.
" —Calvers ..	20 17	17 17	22 7	17 16
Other Breeds—In Milk ..	20 14	17 13	20 8	16 16
" —Calvers ...	16 1	13 12	19 13	15 19
Calves for Rearing ...	12 10	11 5	19 2	15 17
Store Cattle :—				
Shorthorns—Yearlings ...	9 19	9 0	10 4	8 10
" —Two-year-olds ...	14 5	12 14	15 1	12 7
" —Three-year-olds	16 15	14 16	17 3	13 10
Polled Scots—Two-year-olds	—	—	16 11	13 0
Herefords— "	14 12	13 14	—	—
Devons— "	13 18	11 14	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs, and Lambs—				
Downs or Longwools ...	37 2	30 7	—	—
Scotch Cross-breds ...	—	—	37 1	32 9
Store Pigs :—				
Under 4 months ...	21 0	15 4	19 10	15 5

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in
ENGLAND and SCOTLAND in the Month of July, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birming-ham.	Man-chester.	Liver-pool.	Glas-gow.	Edin-burgh.
BEEF :—		per cwt. s. d.					
English	1st	58 0	57 6	58 6	—	59 6*	58 6*
	2nd	55 0	54 0	54 6	—	57 0*	54 6
Cow and Bull	1st	42 0	50 6	51 0	45 0	46 6	48 6
	2nd	38 0	45 6	45 6	39 6	41 6	43 0
U.S.A. and Cana-dian :—							
Port Killed	1st	58 6	55 6	55 6	55 6	56 0	55 0
	2nd	52 0	49 6	52 6	51 0	52 6	49 0
Argentine Frozen—							
Hind Quarters	1st	38 0	39 6	38 6	38 0	39 6	40 0
Fore „ „	1st	28 0	30 0	28 6	26 0	30 6	30 0
Argentine Chilled—							
Hind Quarters	1st	49 0	47 6	43 6	41 6	50 6	48 6
Fore „ „	1st	30 6	33 0	31 6	30 0	35 6	33 0
American Chilled—							
Hind Quarters	1st	60 0	63 0	61 0	60 6	62 0	64 0
Fore „ „	1st	38 0	40 0	38 0	38 0	41 0	41 0
VEAL :—							
British	1st	60 6	65 0	68 0	70 6	—	—
	2nd	56 0	56 0	59 0	65 0	—	—
Foreign	1st	62 0	—	—	—	—	63 6
MUTTON :—							
Scotch	1st	73 6	—	76 6	78 0	78 0	70 0
	2nd	69 0	—	72 6	72 6	67 6	57 6
English	1st	66 6	68 0	73 6	72 0	—	—
	2nd	63 0	57 0	67 6	66 6	—	—
U.S.A. and Cana-dian :—							
Port killed	1st	—	—	—	61 6	—	—
Argentine Frozen	1st	32 6	34 6	32 6	32 6	32 6	32 6
Australian „ „	1st	31 6	33 0	30 6	30 6	32 6	—
New Zealand „ „	1st	41 6	42 0	—	—	42 6	—
LAMB :—							
British	1st	85 0	77 0	76 0	76 0	86 6	77 0
	2nd	77 6	73 0	71 0	69 0	78 0	67 6
New Zealand	1st	54 6	57 6	54 0	54 0	55 6	58 0
Australian	1st	45 6	49 6	47 0	46 6	46 6	—
Argentine	1st	—	50 0	48 6	47 0	43 6	44 6
PORK :—							
British	1st	50 0	57 6	55 6	55 0	51 6	49 6
	2nd	45 6	52 6	47 6	47 0	—	40 0
Foreign	1st	49 6	53 0	52 6	52 0	—	—

* Scotch.

AVERAGE PRICES of British Corn per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1906, 1907 and 1908.

Weeks ended (in 1908).	Wheat.			Barley.			Oats.		
	1906.	1907.	1908.	1906.	1907.	1908.	1906.	1907.	1908.
Jan. 4	28 4	26 0	35 1	24 6	23 11	26 9	18 2	17 3	18 4
" 11	28 6	26 1	35 2	24 8	24 2	26 9	18 4	17 4	18 3
" 18	28 5	26 1	35 5	24 11	24 1	26 11	18 4	17 5	18 5
" 25	28 7	26 2	35 6	25 1	24 5	26 11	18 7	17 5	18 5
Feb. 1	28 10	26 3	35 0	25 1	24 4	26 11	18 10	17 5	18 4
" 8	28 10	26 6	34 3	25 3	24 5	26 9	18 10	17 7	18 3
" 15	28 11	26 7	33 1	25 6	24 1	26 9	19 0	17 7	18 0
" 22	28 10	26 10	32 6	25 4	24 2	26 5	19 0	17 9	17 11
" 29	28 8	26 9	30 11	25 0	24 2	26 3	19 0	17 9	17 8
Mar. 7	28 5	26 8	30 5	25 1	23 11	26 1	18 8	17 11	17 8
" 14	28 5	26 10	31 3	24 8	24 2	26 0	18 10	18 0	17 10
" 21	28 4	26 10	31 7	24 4	24 0	26 2	18 8	18 1	17 11
" 28	28 3	26 8	31 4	24 5	23 9	25 10	18 11	18 2	17 10
Apl. 4	28 7	26 9	31 3	24 2	24 3	25 5	18 11	18 3	17 9
" 11	28 11	26 8	31 2	24 4	23 9	25 10	19 4	18 6	17 7
" 18	29 4	26 8	30 11	24 0	23 3	26 1	19 1	18 7	17 7
" 25	29 6	26 10	30 10	24 0	23 3	25 5	19 6	18 9	17 9
May 2	29 10	27 0	31 6	23 10	23 6	25 8	19 9	19 3	18 0
" 9	30 1	27 6	32 4	24 1	24 0	25 5	20 0	19 7	18 4
" 16	30 3	28 4	33 1	23 10	23 10	24 9	20 1	20 1	18 7
" 23	30 4	29 7	33 8	24 2	24 3	25 9	20 2	20 5	18 10
" 30	30 4	31 4	33 5	22 10	24 0	24 6	20 5	20 8	18 8
June 6	30 3	32 0	33 1	23 4	24 7	25 10	19 11	20 7	18 4
" 13	30 4	31 10	32 7	23 6	24 7	24 5	20 2	20 11	18 4
" 20	30 5	31 4	32 0	22 10	24 11	24 2	20 2	20 9	18 5
" 27	30 3	31 2	31 5	24 3	24 6	24 0	20 1	20 8	18 7
July 4	30 2	31 3	30 11	23 0	24 8	23 11	20 2	20 11	18 7
" 11	30 5	32 0	30 5	23 8	24 10	24 4	20 4	21 11	18 5
" 18	30 3	32 6	30 7	23 2	24 6	23 1	20 5	21 1	18 5
" 25	30 5	32 11	31 5	22 4	27 3	26 5	20 2	20 8	18 6
Aug. 1	30 9	33 2	31 10	22 1	26 4	24 4	19 3	21 2	18 7
" 8	30 5	33 5	31 6	23 0	26 6	23 1	17 11	21 3	18 9
" 15	29 0	33 6	24 2	25 9			17 0	20 4	
" 22	27 9	33 7	25 0	25 0			16 10	19 8	
" 29	26 9	33 10	24 3	24 6			16 6	18 11	
Sept. 5	26 4	31 11	24 9	24 2			16 3	17 7	
" 12	25 11	31 4	24 3	24 4			16 1	17 6	
" 19	25 9	31 5	24 3	25 0			16 0	17 6	
" 26	25 9	31 8	24 8	25 3			16 2	17 8	
Oct. 3	26 1	32 6	25 0	25 5			16 3	17 9	
" 10	26 3	33 3	25 3	25 9			16 7	17 11	
" 17	26 6	34 4	24 10	26 3			16 8	18 0	
" 24	26 7	35 9	24 10	27 2			16 10	18 7	
" 31	26 7	36 3	24 8	27 7			16 11	18 10	
Nov. 7	26 6	35 10	24 8	27 8			17 1	18 10	
" 14	26 4	35 1	24 4	27 8			17 2	18 8	
" 21	26 3	34 7	24 1	27 5			17 3	18 9	
" 28	26 1	34 7	24 1	27 5			17 2	18 7	
Dec. 5	26 1	34 7	24 1	27 1			17 4	18 6	
" 12	26 1	34 8	23 11	27 0			17 3	18 5	
" 19	26 3	34 9	24 3	27 1			17 3	18 3	
" 26	26 0	34 6	24 1	26 10			17 3	18 0	

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates: Wheat, 60 lbs.; Barley, 50 lbs.; Oats, 39 lbs. per Imperial Bushel.

AVERAGE PRICES of Wheat, Barley, and Oats per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

	WHEAT.		BARLEY.		OATS.	
	1907.	1908.	1907.	1908.	1907.	1908.
France : June	42 6	37 9	26 7	25 6	23 0	19 8
July	44 0	37 2	26 3	25 4	22 9	19 8
Paris : June	44 5	38 6	27 8	26 2	23 3	19 3
July	46 6	38 6	27 9	26 2	22 6	19 3
Belgium : March	28 10	32 9	25 7	26 3	20 6	20 8
April	29 4	33 8	25 6	26 5	21 7	20 9
May	31 6	35 5	26 9	26 5	22 2	21 3
Germany : June	33 6	34 6	26 6	26 3	23 9	21 5
July	44 8	44 8	31 3	26 4	27 0	22 3
Berlin : May	45 4	44 9	30 7	26 9	27 5	22 8
June	43 8	47 3	—	—	27 1	22 10
Breslau : May	41 6	44 4	29 0 (brewing)	28 6 (brewing)	25 2	20 9
June	43 6	43 7	26 3 (other)	25 11 (other)	25 3	20 6
			29 0 (brewing)	28 6 (brewing)		
			26 6 (other)	26 0 (other)		

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Monsieur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets. The mark is now taken as equal to 11·8d., and the German prices for the former year have been recalculated on this basis.

AVERAGE PRICES of British Wheat, Barley, and Oats at certain Markets during the Month of July, 1907 and 1908.

	WHEAT.		BARLEY.		OATS.	
	1907.	1908.	1907.	1908.	1907.	1908.
London... ...	33 3	32 0	26 3	26 6	21 4	19 3
Norwich	31 7	30 2	25 1	23 3	20 7	17 11
Peterborough	32 4	30 0	24 1	24 3	20 6	17 7
Lincoln... ...	32 4	29 9	25 10	24 11	20 5	17 6
Doncaster	31 4	30 1	22 4	—	21 0	18 1
Salisbury	32 0	30 11	24 10	—	21 0	18 10

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of July, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Bristol.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
BUTTER :—	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
British ...	per 12 lb. 13 3	per 12 lb. 11 6	per 12 lb. 13 0	per 12 lb. 12 0	per 12 lb. —	per 12 lb. —	per 12 lb. 14 3	per 12 lb. —
Irish Creamery ...	per cwt. 116 0	per cwt. 113 6	per cwt. 117 0	per cwt. 115 0	per cwt. 113 0	per cwt. 110 6	per cwt. 113 6	per cwt. —
" Factory ...	105 0	99 0	108 0	104 6	105 0	98 0	—	—
Danish ...	120 0	117 0	—	—	119 6	116 6	119 0	—
Russian ...	108 0	105 6	110 6	106 6	108 6	104 6	108 6	102 6
Australian ...	109 0	107 0	112 6	106 6	—	—	—	—
New Zealand ...	114 6	112 6	—	—	—	—	—	—
CHEESE :—								
British—								
Cheddar ...	77 6	75 0	74 0	65 0	71 6	67 0	59 0	53 0
Cheshire ...	—	—	—	—	120 lb. 65 0	120 lb. 60 0	—	—
Canadian ...	59 0	58 0	58 6	57 0	58 0	56 6	58 0	56 0
BACON :—								
Irish ...	72 6	68 6	—	—	71 6	66 6	71 6	67 6
Canadian ...	62 0	60 0	61 6	58 6	62 0	59 6	62 0	58 6
HAMS :—								
Cumberland ...	93 0	87 6	—	—	—	—	—	—
Irish ...	95 6	89 6	—	—	—	—	101 0	91 6
American (long cut) ...	57 0	55 0	58 0	53 6	59 0	53 0	60 6	57 6
Eggs :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British ...	11 8	10 0	10 10	—	10 7	7 11	—	—
Irish ...	9 8	8 10	9 2	8 8	9 2	8 2	9 3	7 9
Danish ...	9 11	8 10	9 1	8 5	9 4	8 4	9 3	8 1
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Duke of York ...	110 0	95 0	105 0	95 0	—	—	—	—
Sir John Llewellyn ...	95 0	90 0	90 0	80 0	95 0	85 0	—	—
Royal Kidney ...	110 0	100 0	75 0	70 0	95 0	85 0	—	—
HAY :—								
Clover Meadow ...	86 0	74 0	73 6	—	85 0	63 0	75 6	68 0
Meadow ...	73 6	62 0	66 0	—	—	—	48 0	42 0

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	JULY.		7 MONTHS ENDED JULY.	
	1908.	1907.	1908.	1907.
Swine-Fever :—				
Outbreaks	153	216	1,345	1,559
Swine Slaughtered as diseased or exposed to infection ...	1,151	985	7,219	7,230
Anthrax :—				
Outbreaks	61	65	683	673
Animals attacked	102	78	920	887
Foot-and-Mouth Disease :—				
Outbreaks	—	—	3	—
Animals attacked	—	—	112	—
Glanders (including Farcy) :—				
Outbreaks	80	70	487	540
Animals attacked	202	132	1,522	1,278
Sheep-Scab :—				
Outbreaks	4	6	633	406

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	JULY.		7 MONTHS ENDED JULY.	
	1908.	1907.	1908.	1907.
Swine-Fever :—				
Outbreaks	14	21	124	84
Swine Slaughtered as diseased or exposed to infection ...	608	179	2,687	1,335
Anthrax :—				
Outbreaks	1	—	5	1
Animals attacked	1	—	8	3
Glanders (including Farcy) :—				
Outbreaks	—	2	—	3
Animals attacked	—	6	—	7
Sheep-Scab :—				
Outbreaks	6	7	272	185

SELECTED CONTENTS OF PERIODICALS.

Journal of Agricultural Science. II. 4.

Studies of soil moisture in the "Great Plains" region, *F. J. Alway*. The nitrogen compounds of the fundamental rocks, *A. D. Hall* and *N. H. J. Miller*. Mendelian studies of Egyptian cotton, *W. Lawrence Balls*. Note on the absorption of atmospheric moisture by certain nitrogenous manures, *George Brownlee*. The composition of green maize and of the silage produced therefrom, *H. E. Annett* and *E. J. Russell*. The chemical changes taking place during the ensilage of maize, *Edward J. Russell*. Studies on germination and plant-growth, *S. U. Pickering*.

Journal of the Land Agents' Society. VII. 7.

Woodland industries: Bark stripping. Second Annual Report of the Honorary Consulting Zoologist, *W. E. Collinge*.

Transactions of the Royal Scottish Arboricultural Society. XXI. 2.

A scheme of establishing a national industry of forestry. Root disease in Scots Pine on farm lands, *B. Ribbentrop*. The cultivation of Hardwoods, *J. Boyd*. Impressions of forestry in the Schwarzwald, *J. F. Annand*. Experiments on the relative value of certain timber preservatives.

Journal of the Royal Horticultural Society, June, 1908.

Electric cultivation in relation to horticulture, *B. H. Thwaite*. The commoner birds of our gardens: their habits and food, *C. H. Hooper*. Apple-Leaf spot, *F. J. Chittenden*.

Journal of the Department of Agriculture for Ireland. VIII. 4.

The protection of woodlands, *A. C. Forbes*. An investigation, in County Wexford, of a disease in young cattle, *J. H. Norris*. Mutual live stock insurance in France. Yellow blight in potatoes. The keeping of egg records. The importance of milk records.

Arbeiten aus der K. Biologischen Anstalt für Land- und Forstwirtschaft. VI. 3.

Untersuchungen über die Fusskrankheit des Getreides, *F. Kruger*. Untersuchungen über die Krankheiten der Ruben, *W. Busse*.

ADDITIONS TO THE LIBRARY.

[NOTE.—The receipt of annual publications of foreign agricultural and other departments, experiment stations and societies is not noted in the monthly list of additions to the Library, but a list of all such publications, which are regularly received, will be given from time to time.]

Great Britain—

Wright, Professor R. Patrick.—The Standard Encyclopedia of Modern Agriculture and Rural Economy. Vol. I. A.-Aug. (240 pp.) London: Gresham Publishing Company, 1908. 8s. net.

Westell, W. P., and Cooper, C. S..—The Young Botanist. (199 pp. + 71 plates.) London: Methuen, 1908. 3s. 6d. net.

Baltet, Chas..—The Art of Grafting and Budding. (230 pp.) London: Crosby Lockwood, 1903. 2s. 6d.

The New Market Gardening. (58 pp.) London: The Cable Publishing Company, 1908. 6d. net.

Australasia.—

South Australia, Department of Agriculture and Intelligence.—Notes on Agriculture in South Australia. (61 pp.) Adelaide, 1908.

Denmark—

Bøggild, Bernard.—Mælkeribruget i Danmark. (637 pp.) Copenhagen : Gyldendalske Boghandel, 1907. 12 kr.

Brinkmann, Dr. T.—Die Dänische Landwirtschaft. (197 pp.) Jena : Gustav Fischer, 1908.

Germany—

Oppenheimer, Dr. Carl.—Handbuch der Biochemie des Menschen und der Tiere. 1^o Lieferung. (160 pp.) Jena : Gustav Fischer, 1908. 5m. [The remaining parts as issued will be added to the Library.]

Wulff, C. Das Melken. (20 pp.) Giessen : Emil Roth, n.d. 50 pf.

Reitz, Dr. Adolf.—Milchwirtschaftliche Studien über Frankreich, England, Belgien, Dänemark, Schweden, Holland. (228 pp.) Stuttgart : Reitz, 1907.

Kohl, F. G.—Die Hefefilze : Ihre Organisation, Physiologie, Biologie und Systematik sowie ihre Bedeutung als Gärungsorganismen. (343 pp. + 8 plates.) Leipzig : Quelle und Meyer, 1908.

Gross, H., und Ellerbroek, A.—Das ostfriesische Zuchtgebiet und seine Zuchten. (88 pp.) Leipzig : R. Carl Schmidt, 1903. 1m. 60.

Perseke, Dr. K.—Anleitung zur Bekämpfung des Unkrautes. (48 pp.) Berlin : Paul Parey, 1896.

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Dr. Karbe.—Bekämpfung des Unkrauts durch zweckentsprechende Fruchfolge und Kultur. (23 pp.) Berlin : Paul Parey, 1892. 50 pf.

Ands, L. E.—Das Conserviren des Holzes. (251 pp.) Leipzig : Hartleben.

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Ries, Dr. J.—Beiträge zur Histologie und Physiologie der Befruchtung und Furchung. (71 pp. + 15 plates.) Berne : M. Drechsel, 1908. 16m.

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Wilcox, E. V., and Smith, C. B.—Farmer's Cyclopedias of Live Stock. (745 pp.) New York : Orange Judd Company, 1908.

Campbell's 1907 Soil Culture Manual. (320 pp.) Lincoln, Nebr. : H. W. Campbell, 1907.

Department of Agriculture, Office of Experiment Stations :—Bull. 197.—Organisation Lists of the Agricultural Colleges and Experiment Stations in the United States. (108 pp.) Bull. 199.—Proceedings of the 12th Annual Meeting of the American Association of Farmers' Institute Workers, October, 1907. (78 pp.) Washington, 1908.

Farmers' Bulletin. No. 314.—A Method of Breeding Early Cotton to Escape Boll-Weevil Damage (20 pp.) No. 317.—Experiment Station Work, xlv. (32 pp.) No. 318.—Cowpeas. (28 pp.) No. 319.—Demonstration Work in Co-operation with Southern Farmers. (23 pp.) No. 320.—Experiment Station Work, xlvi. (32 pp.) No. 322.—Milo as a Dry-Land Grain Crop. (23 pp.) No. 323.—Clover Farming on the Sandy Jack-Pine Land of the North. (24 pp.) No. 324.—Sweet Potatoes. (39 pp.) No. 325.—Small Farms in the Corn Belt. (30 pp.) No. 326.—Building Up a Run-down Cotton Plantation. (22 pp.) No. 327.—The Conservation of Natural Resources. (12 pp.) Washington, 1908.

[Books may be borrowed from the Board's Library on certain conditions, which may be ascertained on application.]

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FARM ACCOUNTS.

C. S. ORWIN, F.S.I.

When one considers the amount of attention that has been of late years bestowed upon agricultural matters, some surprise is occasioned that the question of farm book-keeping has commanded so little notice. In any other business it is recognised that an accurate system of accounts forms almost the basis of success, because by this means alone can the trader discover the most profitable lines upon which to develop his undertaking. In this respect the farmer is, of course, at a certain disadvantage in comparison with the purely commercial man, since his sphere of operations is limited by the capabilities of his land, by the resources of his district, and by his own particular bent ; but, even so, it must be obvious that accurate information as to where his profits and his losses really occur would be of the greatest service to him.

Possibly the majority of agriculturists have not had an opportunity of learning the principles of book-keeping, upon which accurate accountancy is based, but at the agricultural colleges throughout the country, where the subject is systematically taught, and where so many farmers of the future are trained, a great opportunity is missed. At these institutions the farm accounts would seem to be arranged with the object of passing the auditor, rather than with that of giving information about the business, and the embryo farmer is encouraged to spend an infinite amount of time and trouble in finding out no more than he might learn in a few minutes from an annual valuation and a glance at his bank book. Whatever variations the individuality of the teacher may suggest, the system, so far as I have been able to ascertain, is uniformly

bad, for though the balance of profit and loss on the farm as a whole is probably correct, yet the separate items from which this balance is obtained and upon which the value of the accounts depends, are purely fictitious. Thus, labour appears as a dead loss, regardless of the fact that all or most of its may have been profitably employed ; the difference between the buying price and the selling price of live stock is taken as clear profit, notwithstanding that when food and attendance are added the balance may be on the wrong side ; feeding-stuffs are charged as a dead loss, though they may have been fed with profit ; corn sold appears as clear gain, in spite of the fact that the cost of production has been considerable ; in fact the whole arrangement, instead of being the last word in farm accounts, is valuable only as a training in the principle of double entry.

The first step in the arrangement of an accurate system of farm accounts is for the farmer to decide under what headings potential profits may be made. These headings will, of course, vary according to individual farming practice, and those suitable for a Kentish hop and fruit grower will not be identical with those required by a Wold sheep farmer. Accounts must then be opened in a ledger under these headings, and it must be borne in mind that sooner or later every item of income and expenditure must be brought into one or other of these accounts. Upon an ordinary mixed farm the accounts opened will be somewhat as follows :—

Cattle accounts	...	...	...	...	1. Breeding stock.
					2. Store stock.
Sheep accounts	...	...	...	...	3. Feeding stock.
					4. Breeding flock.
					5. Lambs.
					6. Feeding sheep.
Pig accounts	...	...	...	...	7. Breeding sows.
					8. Store pigs.
					9. Fattening pigs.
Land accounts	...	...	...	...	10. Arable land.
					11. Meadow land.

The farmer can further sub-divide these accounts to any extent. Thus, different lots of cattle bought to fatten may each have a separate account under the feeding-stock heading ; the milking cows of one breed may have an account separate from that of the cows of another breed ; in fact, the only limit to the amount of sub-division is the time the farmer is prepared to devote to

his book-keeping, and the greater the number of his accounts, the more readily will he get at the results of his farming. No accounts other than these, and not necessarily all of them, must appear in the profit and loss account. Subsidiary accounts will have to be opened in the ledger from time to time, but sooner or later their balances will be transferred to one or more of the foregoing.

*Live Stock Accounts.**—At the beginning of the year each of the live stock accounts must be *debited* with the value of the stock falling under that particular heading. As the year goes on, each account must be debited further with its share of (a) manual labour, (b) horse labour, (c) rent and rates, (d) grazing, (e) foods, both home-grown and purchased, (f) establishment expenses, and any other charges and expenses properly incurred by each account. Each account must be *credited* with (a) the proceeds of stock sold, (b) the value of stock transferred to other accounts.† (c) the valuation of stock remaining at the end of the year, (d) the manorial residues of foods consumed, and with any other receipts. By balancing accounts thus kept, at the end of the year, the *true* profit or loss on each is ascertained.

Arable Land.—At the beginning of the year this account is *debited* with (a) cultivations done, seed sown, and manures applied for the coming crops, (b) unexhausted manures. During the year it will be debited further with (c) all manual and horse labour expended on preparation for sowing, after cultivation, securing and marketing the crops, (d) rent and rates, (e) establishment expenses, and any other charges and expenses properly incurred. The account must be *credited* with (a) the proceeds of corn and other crops sold, (b) the value of corn fed to stock, (c) the value of seeds hay, and straw used for fodder, (straw used for litter may possibly be ignored, since it comes back

* There is no account for horses because it is assumed that only working horses are kept, and the cost of their labour will have to be charged to the accounts for which the work is done. Where horses are bred, an account would be opened under the heading of young horses, and to this would be charged all expenses from foaling until the time when the young stock is sold or added to the working teams.

† There is, of course, a continual transference of stock from one account to another. Thus, where the calves are weaned, the breeding stock account is credited, and the store stock account debited, with their value. When the heifers come into the herd, or when steers are put up to fat, the store stock account is credited and the breeding stock account or the feeding stock account, as the case may be, is debited. Similarly for sheep and pigs. Bulls, rams, and boars are, of course, charged to breeding stock accounts.

into the arable land in the form of dung), (d) mangolds, at the value on the farm, (e) seeds grazed, and fallow crops fed, at their letting value in the district, (f) cultivations done, seed sown and manures applied for the following year's crops, (g) the value of unexhausted manures at the end of the year, and any other receipts. This account, balanced at the end of the year, will show the *true* profit or loss on the arable land.

Meadow Land.—This account must be *debited* with (a) any manures unexhausted at the beginning of the year, (b) manures applied during the year, (c) the labour of haymaking and marketing hay sold, (d) rent and rates, (e) establishment charges, and any other charges and expenses properly incurred. It will be *credited* with (a) the proceeds of hay sold, (b) the consuming value of hay fed on the farm, (c) the value of the grazing after the hay harvest, (d) unexhausted manures, and any other receipts. Here again the balance of the account at the end of the year shows the *true* profit or loss.

This completes the description of the accounts which go to make up a correct profit and loss account, but in order to keep them in the manner indicated, it will be found necessary to open various subsidiary accounts.

Labour.—No ledger account is required for *manual* labour. The daily or weekly labour sheet shows how each man has been employed, and his time can be charged to the proper account. It is not desirable to enter it in the ledger daily, but an analysis sheet can easily be kept, and the labour under the different headings posted to the proper accounts weekly, monthly, or quarterly. For *horse* labour a ledger account is essential. This account will be debited with (a) the valuation of the horses and their harness at the beginning of the year, (b) cost of food during the year, (c) shoeing, (d) repairs to harness, (e) share of rent, and any other expenses properly chargeable. The only *credit* will be the valuation of horses and harness at the end of the year, and the balance of the account represents the cost of the horse labour on the farm. This cost must be shared out over the different accounts, according to the amount of horse labour performed for each. The readiest means of arriving at this is by keeping a record of the number of days' work done for each account. The labour sheet, besides stating how each man has been employed, should set forth the number of horses

he has had with him. These are apportioned amongst the various accounts and the totals are carried forward from week to week till the end of the year. The cost of the horse labour may then be allocated in proportion to these totals.

Rent and Rates.—These require no ledger account. Rates are easily apportioned between land and buildings by taking the rate collector's figures. Generally speaking, the buildings will be taken as representing about 10 per cent. of the rateable value of the holding, and rent may be apportioned between land and buildings on the same basis. Rent and rates on buildings* must be apportioned over the cattle and other accounts, whilst rent and rates on land must be divided between arable, meadow, and pasture.

Grazing.—No profit or loss is made on pasture land, because its produce is not directly marketable. It serves solely to supply food to the live stock of the farm, and in order to ascertain the cost of this food it is necessary to open a ledger account for grazing, *debiting* it at the commencement of the year with any unexhausted manures, and during the year, with rent and rates, and the value of the manurial residues of foods fed on it. On the *credit* side of the account will appear the value of manurial residues unexhausted at the end of the year, and the balance of the account will show the cost of the grazing for the year. This cost must then be charged to the various cattle and sheep accounts, according to the number of days' grazing enjoyed by each.†

Purchased Foods and Manures.—Whenever possible, these are to be charged straight away to the account which will use them. When this cannot be done, a ledger account for purchased foods and manures must be opened, *debiting* it with purchases, and *crediting* it with foods consumed and manures used from time to time. The different stock accounts will be debited with what they eat and the different land accounts with the manures they receive. The balance of the account at the end of the year represents foods and manures on hand, and is carried forward to the year following.

* If the farmhouse and cottages are not separately assessed, a proportion of the rent and rates charged on buildings must be allocated to establishment (*q.v.*) in respect of them.

† To simplify this apportionment each beast may be reckoned as the equivalent of 6-8 sheep.

Implements.—Another ledger account is required under this head. It is debited with the valuation of the implements at the beginning of the year. The depreciation during the year is arrived at by preparing an inventory and valuation of all implements and estimating the life of each. The true depreciation with which to credit the account is thus arrived at and the valuation at the end of the year is got by subtraction. It is a matter of no little difficulty to apportion the depreciation of implements over the accounts with accuracy, but with a little thought and trouble it may be accomplished. Thus it will be obvious that the loss in the value of ploughs, harrows, binders, reapers, &c., should be charged to the arable land ; the loss on cake-breakers, root-cutters, &c., to the stock, and so on. Depreciation on carts, wagons, &c., which are used for all manner of purposes, can either be charged to the horse account, thereby increasing the cost of the horse labour, or it may be carried to the establishment account.

Establishment.—It will be found in keeping accounts on the lines here indicated, that certain payments and charges arise which cannot fairly be placed to any of the accounts yet mentioned. The foreman's wages, repairs to farm roads, travelling expenses, keep of the farmer's nag horse, &c., cannot be dealt with on the lines laid down. For these matters an establishment account is opened in the ledger, and the method of dealing with it adopted by the writer is to share the balance over all the other accounts in proportion to their turnover—the assumption being that the account with the largest turnover has benefited to the greatest extent by the establishment expenditure. This is a very rough and ready way of disposing of the account, and to reduce any error to a minimum, the total under this head must be kept as small as possible ; that is to say, nothing must be charged to it that can by any means be placed direct to the other accounts.

Within the limits of a short article one cannot do more than suggest the lines upon which farm accounts should be kept, and the varying requirements of varied farming practice make it impossible to indicate any set forms of labour sheets or book rulings universally applicable. But enough may have been written to enable the thoughtful reader to evolve his own particular system, and he can be guaranteed both pleasure and profit in the process.

AGRICULTURAL CREDIT SOCIETIES.*

Agricultural credit societies or banks are combinations of small farmers or labourers formed for the purpose of raising capital to be advanced at a reasonable rate of interest to members requiring temporary loans for the purpose of reproductive undertakings. The small holder, the labourer with an allotment, the market gardener, or the small village tradesman may occasionally require a loan to enable him to make purchases on favourable terms of such requirements as live stock, seeds, manures or implements, and it is to meet this want that the establishment of agricultural credit banks has been urged in England. Among the peasant proprietors of the Continent, these co-operative loan societies have proved very successful, and in districts where small cultivators are sufficiently numerous there seems no reason why the methods which have proved successful elsewhere should not be adapted to meet local conditions in England.

Limited and unlimited Liability.—There is, however, no one method which has been universally adopted abroad, and even as regards broad general principles, there exists the widest diversity. The continental societies may, however, be broadly divided into two classes, those with limited and those with unlimited liability of members. The latter type is perhaps the more largely developed, and it was on this basis that the two main systems of credit, called after their inventors the "Raiffeisen" and the "Schulze-Delitzsch," were first founded. The main features of banks of the "Raiffeisen" type are (1) that no shares are issued, the capital being raised by entrance fees, subscriptions and deposits, and loans bearing a fixed rate of interest; (2) that the liability of the members is unlimited, every member being jointly and severally responsible for any losses that may be incurred by the society; (3) that the loans advanced by the societies are for repro-

* Articles on Agricultural Credit abroad have appeared in previous numbers of this *Journal* as follows:—"Agricultural Credit Banks," May, 1905, p. 96; "Agricultural Credit in France," June, 1905, p. 149; "Agricultural Credit in Hungary," July, 1905, p. 210; "Agricultural Credit in Belgium," August, 1905, p. 279; "Agricultural Loans in Queensland," September, 1905, p. 375; "Agricultural Credit in Germany," March, 1906, p. 725; "Agricultural Credit in Denmark," May, 1906, p. 118; and "Agricultural Credit Banks in Cape Colony, Natal, Transvaal and Western Australia," February, 1908, p. 689.

ductive purposes only, the borrowers being required to satisfy the managing committee that the object for which the loan is required is one that affords a reasonable security for his being able to repay the loan at the date fixed ; and (4) that the operations of the society are confined to a small area in order that the personal character and needs of applicants for loans may be known to the members and committee.

The collective liability of the members to the extent of their whole means arose partly from the fact that it was the only system on which such societies without means of their own could raise money to lend to their members, and also that at the time of their foundation it was the only system recognised by the German law. In some parts of Germany, however, the principle of unlimited liability has not been received with favour, and the explanation is to be found apparently in the distribution of the agricultural population. In districts where small peasant proprietors predominate, all of a similar station in life and not varying very greatly in wealth, the Raiffeisen principles have made great headway, but where farms of different sizes occur the various classes are disinclined to share on equal terms the burden of unlimited liability, and some form of limited liability has been preferred. It is possible for this reason that co-operative credit banks based on unlimited liability have up to the present made so little progress in England, while in Ireland where there is a greater preponderance of holders of the same class, they have increased in numbers with considerable rapidity. It appears, for instance, that in 1907 there were only 15 agricultural credit societies in England and apparently none in Scotland, whereas there were 246 societies in Ireland, which had loans outstanding in that year to the amount of £50,164, and had a membership of 15,100. With an extension in the numbers of small holdings in this country, the opportunities for the establishment of credit banks are likely to become more numerous.

The agricultural co-operative credit societies formed up to the present are usually based on the principle of the unlimited liability of the members for the debts of the society, because this joint liability provides a security on which money can be borrowed at normal rates of interest. A community of small cultivators, who may wish to form a society of this

kind are unlikely to be able to raise enough money among themselves to provide a sufficient capital to enable an institution of this sort to be founded on an independent footing. It has therefore been found necessary to work on the lines of the Raiffeisen banks, but in order that these societies may be maintained on a sound financial footing it is in the highest degree essential that the importance of the two main principles of the Raiffeisen banks should be fully recognised.

Loans Granted for Reproductive Purposes only.—It is necessary in the first place that the societies should lend money for reproductive purposes only ; such as, for example, the purchase of manures, feeding stuffs, cattle, sheep, pigs and poultry, the erection of buildings, glasshouses, &c. It must be remembered that borrowed money can only be utilized with advantage if the margin of profit obtained from its employment is higher than the rate of interest paid for it. The possibility of obtaining money on favourable terms constitutes one of the strongest arguments for co-operative banks, but it is necessary that the probability of obtaining a higher profit from money thus obtained should be clearly shown. In this connection it may be noted that the Department of Agriculture for Ireland in its Annual Report for 1906-7 observes, "It is of the greatest advantage to the poor farmer to obtain a loan on easy terms if the money is properly applied to a reproductive purpose, but if the loan merely tempts him to increase his liabilities, without any ultimate prospect of finding himself in an improved position, it can but injure him."

Moreover, it is essential that the promissory note signed by the borrower should depend for its value not merely on the signature of the borrower and his sureties, but that it should have behind it, as it were, goods actually purchased with the money. Loans should never be granted for the payment of debts, nor is it desirable that loans should be renewed, or new loans granted, in the place of old ones which have not been discharged. The possibility of unfavourable seasons, unproductive crops and unsatisfactory prices should always be borne in mind.

Need for Limiting the Operations of each Society to a Small Area.—The second principle of importance in unlimited liability societies is that of confining their operations to a

small area. It is obvious that where loans are granted on personal security an intimate acquaintance with the circumstances of each of the members and particularly of their character, for sobriety, honesty and integrity is absolutely necessary. This can hardly be the case if a society extends beyond the limits of, at the most, two or three parishes, but the need for limiting the area necessarily results in each individual society possessing but small powers of raising money.

Advantages of a Central Bank.—The drawbacks connected with this restriction of the operations of the societies were recognised in Germany at a very early stage in the existence of the Raiffeisen banks, and the need was felt for a central institution which could borrow money on the collective responsibility of a number of societies, and also utilize any available balance in the hands of one society for the benefit of another. Provincial central banks were therefore formed and these were again, in some cases, centralized in a still larger institution. At the present time the principle of a central bank may be said to be recognised in all the continental countries where co-operative credit has been at all developed, though there is some difference of opinion as to the methods on which it should be managed. In England an institution of this kind, known as “the Central Co-operative Agricultural Bank, Limited,” has been registered under the Industrial and Provident Societies Act, 1893, for the purpose of financing the village co-operative credit societies affiliated to the Agricultural Organisation Society.

It is hoped that this bank will also enable the societies to overcome certain difficulties which have been experienced in dealing with their deposits. These deposits ought to form the principal source from which their working capital is obtained, but it is pointed out in the report of the Agricultural Organisation Society for 1906 that if a large deposit is offered, the society may not be able at the moment to lend it out, and its only course is to pay it into its own account at the local joint stock bank, where, if it is earning interest at all, it is not earning as high a percentage as the society is obliged to pay for it, and the society accordingly loses. Again, if the deposit is withdrawable at short notice the society cannot

without risk of being placed in a difficulty lend out the money for long periods. The newly-established bank will place the societies in a better position in this respect, as it will be prepared both to receive surplus deposits from local societies and to advance money to them when required.

Method of Forming a Society.—An agricultural credit bank of this type may be registered as a “specially authorised society” under the Friendly Societies Act, 1896, on application to the Registrar of Friendly Societies, 28, Abingdon Street, S.W. This application must be made on a special form to be obtained from the Registrar and must be accompanied by two printed copies of the proposed rules. No fee is payable for the registration of an agricultural credit society. The rules must comply with the Act, and it may be noted that the Act provides that the loans must be confined to members; that the rules must fix a maximum for any loan made to a member on personal security, and that no loan can be made which, together with moneys owing for the time being by the member to the society exceeds £50; that the total amount held at any one time on deposit cannot exceed two-thirds of the total sums for the time being owing to the society by the borrowing members; and that no member can hold an interest in the funds exceeding £200. Where, however, such a “specially authorised society” divides no profit among its members and watches over the application of the money lent, it is entitled under the Societies Borrowing Powers Act, 1898, to make a rule authorising it to borrow money from any person whether a member or not; otherwise the Friendly Societies Act, requires the “loan fund” to be formed by contributions or deposits from members only, subject to the limitations mentioned above. [25]

A form of rules has been prepared by the Registrar of Friendly Societies for the purpose of assisting specially authorised societies in complying with the provisions of the Friendly Societies Act so far as they relate to such societies. A set of model rules specially adapted to agricultural credit societies is also issued by the Agricultural Organisation Society, Dacre House, Dacre Street, Westminster, S.W., and this society will assist in the formation of these agricultural credit banks.

These rules prescribe the terms of membership and provide

for the appointment of the committee, trustees, treasurer and secretary, for the holding of meetings, the keeping and auditing of the accounts and other matters.

The rate of interest on loans and the date of repayment are not fixed by law, but the model rules of the Agricultural Organisation Society provide that when a loan is granted it may be for some fixed term not exceeding twelve months, or it may be repayable in instalments at intervals of one, two, four, six or eight weeks, or three months ; the interest to be charged for loans not made repayable by instalments is not to exceed 6 per cent. per annum ; the interest on deposits is not to exceed 4 per cent. per annum ; no profit, bonus or dividend of any kind is to be divided among the members, and any surplus after payment of the cost of administration is to be carried to the reserve fund.

While loan societies, registered as specially authorised societies, cannot claim exemption from stamp duty, priority of claim against the estates of their officers in event of death or bankruptcy, agricultural credit societies have the advantages of those sections, but the other special privileges of the Friendly Societies Act, 1896, are not extended to either.

Assistance of County Councils in the Formation of Credit Banks.—The position as regards the formation of credit banks has been somewhat modified by the Small Holdings and Allotments Act, 1907, which authorizes a county council to promote the formation or extension of co-operative societies having for their object the provision or the profitable working of small holdings or allotments, and under this definition societies for the purpose of credit banking are specifically included. The county council, with the consent of, and subject to regulations made by the Local Government Board, may assist such societies by making grants or advances, or may guarantee advances made to the society upon such terms and conditions as the Council may think fit.

Number of Existing Societies.—Only a few of these societies exist in England at present, but they appear to be doing a useful work among small cultivators, village tradesmen, allotment holders and the rural labouring classes.

According to the report of the Chief Registrar of Friendly Societies for 1906 (Part A, Appendix N, Sections I-IX), the

following 12 societies were registered in England on the 31st December, 1905. . The Muskhamb Credit Society, which was registered in 1904, was dissolved in 1906 :—

		Date of Establish- ment.	Number of Members.	Amount of Funds.
Cambridge—				£
Cottenham Agricultural Credit Society	...	1896	20	11
Hampshire—				
Hedge End Agricultural Credit Society	...	1896	32	219
Bedford—				
Clophill Credit Society	...	1900	16	—
Lincolnshire—				
Spalding and District Credit Society	...	1904	98	203
Friskney Credit Society	...	1904	27	12
Scawby Agricultural Credit Society	...	1894	28	42
Norfolk—				
Whissonsett Small Holders Credit Society	...	1905	18	26
Wiggenhall Agricultural Credit Society	...	1896	46	68
Suffolk—				
Laxfield Agricultural Credit Society	...	1894	10	10
Warwick—				
Grandborough Village Bank	...	1895	7	165
Worcester—				
Far Forest and District Credit Society	...	1903	11	50
Castle Morton Agricultural Credit Society	...	1895	19	1

Some account of the operations of these societies will be found in the publications of the Agricultural Organisation Society. The Wiggenhall Agricultural Credit Society, for example, is described in the Society's *Journal* for March, 1908. This society, which has been in existence twelve years, was established with the assistance of a local landowner, who provided part of its first capital by placing the sum of £50 on deposit. It also raised capital by taking deposits of 1s. and upwards from members to bear interest at 4 per cent. up to £20 and at 3 per cent. when over that amount. In December, 1906, the funds of the society amounted to £138, of which about £68 were deposits, while the outstanding loans amounted to £114. The purposes for which loans have been granted are buying horses and ponies for tradesmen and small holders, buying live stock, manure, seeds, repairing green-houses, &c. One member has been able to take a small holding with the assistance of a loan from the society, together with his deposits over a number of years. The present membership is 47.

Another society at Friskney advanced money in 1905 to the amount of £97 for such purposes as the purchase of a cow and a pig, of implements on the borrower taking a larger holding, and to assist a man who was purchasing his holding. The Hedge End Credit Society granted loans amounting to £180 for the purchase of seeds and manure. None of the societies appear to have suffered any losses.

Societies with Limited Liability.—Where the principle of unlimited liability is felt to be unsuitable, or unnecessary for the purpose of raising capital, a society "for carrying on the business of banking" with limited liability can be established under the Industrial and Provident Societies Act, 1893. The share capital must be transferable and not withdrawable, and no member can have any interest in shares exceeding £200. Application for registration must be made on a special form to the Chief Registrar of Friendly Societies, 28, Abingdon Street, S.W., and the fee is £5 unless the Society adopt certain model rules.

FRUIT AND VEGETABLE PRODUCTION IN GERMANY, FRANCE AND HOLLAND.

In response to an enquiry addressed to the Foreign Office as to the fruit and vegetable trade in certain countries, the Board have received a number of interesting reports from Consular officers, some extracts from which are given below :—

GERMANY.

Hamburg.—Sir William Ward, H.M. Consul-General at Hamburg, states that the export trade in fresh fruit from Hamburg to the United Kingdom is naturally subject to considerable fluctuations, dependent on the crop in Germany and the demand in England. In 1903 some 23,000 tons, valued at £260,000, were exported and in 1905 10,900 tons, valued at £120,000. The principal fruits which are exported from Hamburg are bilberries, gooseberries, black and red currants, and a cheap variety of plum. The latter is, as a rule, exported in the largest quantities, though the prices obtained are sometimes very small. These plums are chiefly grown in Thuringia, the Harz district and Bohemia, and are forwarded in bulk to Hamburg, where they are packed into

sieves, &c., for shipment. Cherries, which are probably the next most important fruit, are extensively grown in the neighbourhood of Hamburg, as are also gooseberries and currants. Among wild fruit, bilberries, which grow in great abundance in Germany, are largely exported and of recent years there has been a considerable and increasing demand from England for sloes.

No fruit is exported to the United Kingdom from Bremen, but a business is done in potatoes, which are bought by British firms from the interior of Germany. Large quantities of cherries and also of horse-radish are grown in the Harburg district and exported to England *via* Hamburg.

Dantzig.—Colonel Brookfield, H.M. Consul at Dantzig, reports that though potatoes and fruit are largely grown in his Consular district, there is no general trade in these products with the United Kingdom. Potatoes have now and then been exported, but only by way of sample shipments, and as regards fruit it is improbable that any is ever sent away as there is a demand for apples and other fruit from America and the Colonies.

Stettin.—The British Consul at Stettin (Mr. Ralph Bernal) reports that only insignificant quantities of apples and plums are shipped from Stettin to this country, but that in some years potatoes figure in the returns to a not unimportant extent. The home demand for fruit from Stettin and Berlin is very large, and districts like Greifenhagen, which are favourably situated and enjoy good water and railway communication, are enabled to sell at very remunerative prices, so that there is little or no inducement to seek for an export trade, better prices being paid locally for fruit than can be obtained abroad except in seasons of exceptional abundance. Rhubarb is imported from Denmark and cranberries from Sweden, Norway and Russia.

Fruit-culture in Pomerania has progressed during the last few years, owing to increased planting of trees and the growing of fruit in conjunction with vegetables. All the public roads are being systematically lined with fruit trees by the local authorities, and the produce is sold by auction before it is ripe. Efforts are made to interest small farmers in the growth of fruit, and instruction is given by migratory teachers.

Whole villages or districts have in some cases undertaken the growth of one special fruit, with a view to simplifying the wholesale disposal of the product. The production of fruit is further encouraged by awarding prizes for orchards and gardens.

German Reports on Foreign Fruit Crops.—In compliance with the wish expressed by members of the fruit trade, and at the request of the *Volkswirtschaftlicher Verein*, the Minister of the Interior has established a service for the purpose of reporting on the fruit and vegetable markets of foreign countries. These reports include particulars of coming crops, results of the crops, market and sale conditions, prices, export, industries connected with the fruit trade, and also information respecting the sale of German produce and means by which the sale of German products may be facilitated.

FRANCE.

Dunkirk.—According to a report received from H.M. Consul at Dunkirk (Hon. R. Walsh), the export trade from that port to the United Kingdom of fresh fruit locally grown, which was at no time an important trade, has declined very much of late years as the gardeners find a more profitable market for their produce in their own country and in Belgium. At one time there was a considerable cultivation of gooseberries, currants, pears and apples all along the coast between Dunkirk and Gravelines, and much of the produce found its way to the English market, but this industry has now practically disappeared and the ground has been cleared for the cultivation of beetroot and chicory.

The only district where market gardening is still carried on to any extent is that of Rosendaël, where some 600 to 700 acres have been cut up into small gardens and are devoted to the cultivation of cherries, gooseberries, plums and vegetables. The gardeners of Rosendaël have formed an association with one of their number as president, who undertakes all the organisation of the supply, the fixing of prices, and various other details connected with the trade. It is proposed to establish a bureau, with a paid staff, whose business it will be to find new markets for all garden produce and to collect information affecting the trade. Mr. Walsh

understands that hopes are entertained of establishing a regular export trade to the United Kingdom, particularly in vegetables. The present shipping arrangements, however, would not admit of the British markets being served at fixed times by the existing routes, and the cost of carriage to Calais or Boulogne and thence to the United Kingdom would probably be too high to leave a margin of profit.

Calais.—Mr. C. A. Payton, H.M. Consul at Calais, reports that very little fruit or vegetables of local production are exported to England; the large exportation, which takes place in the summer, by special cargo boats belonging to the South Eastern and Chatham Railway arranged so that the consignments reach London early in the morning, comes from the neighbourhood of Paris and the south and centre of France. The principal periods of shipments are for cherries, strawberries, and green peas from 31st May to 26th June, and for plums, peaches, apricots, melons, French beans, &c. from 22nd July to 16th August.

Boulogne.—In the same way the large shipments from this port are not of local production, and Mr. Vice-Consul Farmer reports that radishes are practically the only local vegetables exported. The climate enables these to be placed on the British markets, *via* Folkestone, London, and Goole, some three weeks earlier than the home produce. It is quite an ephemeral traffic, lasting about three or four weeks, and ceasing when prices fall below 2d. per dozen bunches.

Dieppe.—Mr. Vice-Consul Lee-Jortin reports that cider apples are chiefly grown in this district, but after these plums are perhaps the most grown. A certain quantity of the ordinary kinds of plums are exported to the United Kingdom, chiefly in September, the better sorts being either consumed locally or sent to Paris. Table apples are exported in small quantities in October. Fairly large quantities of potatoes, grown in the neighbourhood of Le Mans and Orleans, are also sent away.

Caen.—Mr. Vice-Consul Hettier reports that cherries, gooseberries, plums and other small fruits are not produced in this district in large quantities, but the local authorities are making a great effort to promote small associations to encourage the growth of these small fruits and also of pears.

The cultivation of vegetables is practised only on a narrow strip of land bordering the sea coast from Ouistreham to Courseulles. Potatoes are very early there, but the exports are small and only amounted to 130 tons in 1906. Carrots and onions are also successfully grown, but are chiefly consumed locally.

Honfleur.—Horticulture is one of the principal resources of this part of Normandy, and Mr. Charlesson, the British Vice-Consul, reports that all the farms in this part of France are divided into plots surrounded with thick hedges and planted with cider apple, plum, cherry and pear trees. The land is grazed by cattle and regularly manured every spring. In properly-managed orchards, apple trees over 15 years old have the bark scraped off with a special tool in January or February and are then lime-washed to destroy insects and fungi. The soil chosen for the cultivation of both cider and table apples is generally of inferior quality, dry and stony slopes being favoured, but those facing south and south-west are preferred.

The varieties of cider apples, mostly cultivated are Bedan, Bouteille, Joly, Cimeterre, Belle fille, Sorte à Renoult, Taureau, and Peau de vache. The apples are made into cider locally, but several thousand tons are sent annually to Germany. Table apples are chiefly consumed in the country, though a few are sent to England. The varieties grown are Eclat, Reinette de Caux, Reinette d'Angleterre, Reinette de Bretagne, Pigeonnet and Calvil blanc.

Several varieties of small pears are grown, such as St. Clair, Liberge, Mouy, Rozé, Beurré gris, Rousselet doré, Souris, Fontaine and Catillac, the two latter being stewing pears. The fruit is packed loose in boxes and sent to London and Birmingham.

Cherry and plum trees are abundant. The fruit is packed in baskets holding 17 lbs. and sent to the North of England, Birmingham, Liverpool, Manchester, Hull, &c. Better soil is selected for cherries and plums than for apples and pears, and valleys are preferred. The varieties of plums grown are Orleans, Egg plum, Cherry plum, Gaillon and greengages, and the varieties of cherry are Angers, Collet, Guigne dure, Red and White Hearts.

Table pears are grown in gardens which are surrounded with brick or stone walls, or sometimes by clay walls, which in fact are considered the best. Espaliers are planted 10 ft. apart and trained on the Léverrier system; these are called "candelabres," or chandelier shape, and yield the finest fruit, while another method is the "Palmette" or palm leaf shape. The latter are planted 13 feet apart as they cover more space. The "Leverrier" takes about three years to yield fruit in any quantity, while the "Palmette" requires at least five years. This latter system is much practised as the trees last longer than the "Leverrier" and attain a greater development on the walls, some covering 30 ft. and yielding between 250 and 300 fine pears. The varieties cultivated on walls are Williams, Duchesse, Louise Bonne, Doyenné du Comice, Beurré Hardy, Beurré Clergeau, Beurré superfin, Beurré d'Aremberg, Doyenné d'Hiver, Olivier de Serres, Crassane, Passe Crassane, General Totleben, and William Duchesse. The same varieties are grown in the open part of the gardens as pyramids, being planted 13 ft. apart each way. Those grafted on quince are preferred. The grafting is always level with the ground and the young pear trees are allowed to grow gradually, being pruned every autumn. A tree planted 3 years after grafting takes 12 years to come into full bearing and it may then produce 200 pears. The fruit, of course, varies in size, but when there are signs of an abundant crop, part of the fruit is plucked off when about the size of a nut.

Packing is a very important point with table pears, and the greatest care is exercised. The fruit is put in layers in boxes with wood fibre, from 36 to 70 William pears being put in a box, according to size.

The cultivation of gooseberries has been almost abandoned, but red and white currants are largely grown.

The following information respecting several French Departments where fruit and vegetable growing is carried on for export has been supplied by Mr. A. P. Inglis, H.M. Consul-General at Paris, and is taken from a publication of the Ministry of Agriculture entitled "*Notice sur le Commerce des produits Agricoles*," 1906.

Côte d'Or.—In this Department agricultural produce

is extremely varied according to the nature of the soil and climate. In the valley of the Saône, where the soil is light and permeable, market gardening is extensively carried on. The *Côte* which gives its name to the Department is a narrow stretch of country mostly planted with the vine from which the renowned wines of Burgundy are derived, but a portion of the district is devoted to fruit growing. Cherries, peaches, and currants are cultivated on an extensive scale. The area under potatoes is estimated at about 55,000 acres and hops occupy about 2,300 acres. Local breweries absorb about one-fiftieth of the production, the remainder being exported to various centres in France and to London. The hops of Burgundy form a third of the French production and are held to be of first-rate quality.

Fruit production in this Department gives rise to an extensive trade with Paris and England, the fruit exported being chiefly cherries, black currants and raspberries. An improvement is said to be noticeable in the varieties of cherry selected for cultivation. Peaches and apricots are mostly consumed locally. Peas, haricot beans, asparagus and onions are grown on a large scale.

Oise.—In several districts vegetable growing, chiefly dried haricot beans, French beans and artichokes, is conducted on an extensive scale for the supply of the Paris market and for export to England. About 2,000 cwts. of cherries, known as "Guignes," are sent to Paris and England in June and July, and about 500 cwts. of black currants. Peas are also exported to some extent.

Seine-et-Marne.—Near Coulommiers and beyond Crécy on the slopes of the hills bordering the valley of the Grand Morin, fruit growing is extensively carried on; in good years in this district the sales of the blue plum to agents who forward to Paris and to England amount to 4,000 cwts. of other varieties some 1,000 cwts., of the Reine Claude 1,400 cwts., of small early peas 1,000 cwts. and some 800 to 1,000 cwts. of currants and raspberries. The fruit is packed in round baskets containing about 22 lbs. net. In 1902 some of the growers, in view of the large profits reaped by the middlemen, formed an association and as the result of this co-operative movement succeeded in obtaining double the amount

previously received for the early Carrière pear and for blue plums. In 1903 another association was formed near Crécy with similar results. In the sandy soil about Melun the potato is largely cultivated, the output of the district amounting to 7,000 or 8,000 tons. The potatoes are exported from the end of August to February or March, and a portion of the supply comes to England.

Seine-et-Oise.—This Department encircles the Department of the Seine and provides the bulk of the vegetables and forage required for the supply of Paris. Potatoes, tomatoes and asparagus are forwarded to London. In several communes special attention is paid to the cultivation of table pears, the favourite varieties being Duchesse d'Angoulême, Louise Bonne, Beurré Diel, Bon Chrétien, William, Beurré Hardy and Doyenné. The fruit is sold by auction at Paris or to buyers on the spot, who send it to England and to Russia. An association has been formed at Grosley which makes consignments to England.

Loir-et-Cher.—This Department is almost entirely agricultural. The cultivation of haricots and peas is increasing every year. Peas are grown principally on the hillsides bordering the valley of the Loire, and the potato is cultivated throughout the Department; a large portion is consumed locally and the remainder goes to Paris and London. Owing to the facilities for communication with Paris and other centres, vegetable growing is carried on in most districts. The cultivation of the asparagus only recently introduced now occupies some 3,200 acres, with an output valued at £40,000.

HOLLAND.

Owing to the absence of the necessary data, it is impossible to furnish an adequate idea of the importance of the fruit and vegetable industry in Holland, but Mr. Henry Turing, H.M. Consul at Rotterdam, states, as an example, that the value of the garden produce exported in 1905 was estimated at about £1,500,000, of which the bulb trade accounted for £600,000, the principal buyers being England, Germany and the United States. Strawberries, cabbages, cucumbers and apples are largely sent to Germany, while potatoes, onions, cucumbers, pears, cherries, gooseberries, and black, red and white currants come to England.

As a productive area South Holland is the most important, the chief centre being the "Westland," where the soil is mostly sand and gravel and very suitable for market gardening. Cucumbers are largely raised, but it is only in April that large supplies are available for export. In February and March the demand from Germany causes buyers to resort to the English market, where a supply is available earlier. Some growers have adopted the English method of forcing, and in the last few years a considerable number of glass-houses have been built. Almost every other kind of vegetable is also grown.

The fruit grown consists of currants, plums, apples and grapes, the latter on an extensive scale. The currants are little suited for the table, but are bought by jam makers. Plums grow along the edge of the ditches and between the currant bushes, a well-known yellow kind being picked in an unripe condition for export to England. Fruit culture, however, in many parts of Holland is comparatively unimportant owing to a lack of knowledge, but more attention is now being devoted to the subject, especially as regards growing under glass, and the cultivation of currants.

In the province of Zealand the fruit crops consist principally of cherries, apples, pears and currants. Large quantities of plums are also grown, which find their way to the English market. At one time about 15 varieties of apples were grown, but the number has recently been reduced, and the principal kinds now raised are the Brabant Bellefleur, Gold Reinette and Court pendu. The pear crop is small as compared with that of apples.

Owing to the lack of quick communication between the fruit-growing districts and the principal shipping ports, the cultivation of produce unable to stand a long journey is not extensive and is limited to local needs. Notwithstanding the direct service from Flushing, the bulk of the products are forwarded from Rotterdam, whence access is obtained to various English ports, whereas the Flushing route only takes produce to London.

In North Brabant vegetables are extensively grown, but the standard of cultivation is not particularly high. They are principally grown in the open air, frames and hothouses

being but scantily used, but in some parts cultivation under glass is attracting attention. There are many fine but not extensive apple orchards, and pears are also grown, as well as strawberries, cherries, raspberries and currants.

As regards the islands of Walcheren and South Beveland, Mr. de Bruyne, the British Vice-Consul at Flushing, reports that the fruits chiefly grown are currants, gooseberries, pears, apples, cherries and plums. Part of this fruit goes to the large towns in the Netherlands, but a great deal is exported to England and Germany. The total area covered by the exporting orchards is 4,700 acres. The soil under the trees is in most cases used for grazing, but as it has been found that the grass interfered with the growth of the trees, it has in many instances been removed and gooseberries or currants planted underneath, or in other cases the ground is devoted to strawberries or garden crops. Cherries, though still an important crop are decreasing, and they have suffered much from insects and fungi.

AGRICULTURAL RETURNS OF 1908.

The preliminary statement of the acreage and live stock returns issued by the Board on the 31st August shows that the total acreage under crops and grass in Great Britain amounted to 32,211,381 acres in 1908, this representing a decline of 32,066 acres from the area so returned in 1907. The changes in the extent of arable and pasture land respectively, and in the chief categories of crops, may be summarised as follows :—

Crops.	1908.	1907.	Increase or Decrease.	
	Acres.	Acres.	Acres.	Per cent.
Cereal crops	6,914,595	6,997,514	- 82,919	- 1·2
Other „ „ „	3,144,078	3,215,638	- 71,560	- 2·2
Clover and rotation grasses	4,421,587	4,490,961	- 69,374	- 1·5
Bare fallow... ...	315,252	261,450	+ 53,802	+ 20·6
Total arable ...	14,795,512	14,965,563	- 170,051	- 1·1
Permanent pasture ...	17,415,869	17,277,884	+ 137,985	+ 0·8
Total	32,211,381	32,243,447	- 32,066	- 0·1

There has thus been a decline in each group of crops, against which has to be set the increase in the area uncropped and

pasture. The decrease of nearly 83,000 acres in the area under cereals brings the figure for these crops below that of 1904, the lowest hitherto recorded. Other crops—excluding clover and rotation grasses—exhibit the largest relative decrease. Clover and rotation grasses have more than lost the increase of 50,000 acres recorded last year, and now stand at a lower figure than in any year since 1884. The area of the bare fallow, which decreased considerably in each of the last three years, has this year increased by nearly 54,000 acres, or more than 20½ per cent. The decrease in the arable land amounts, on the whole, to 170,000 acres, or rather more than 1 per cent., of which 138,000 acres are accounted for by the further extension of permanent grass.

Among the cereal crops wheat alone shows an increase, amounting to less than 1,300 acres. Barley has declined by nearly 45,000 acres, and the area under this crop is the lowest on record. Oats show the relatively small decrease of 14,000 acres, and the area under this crop is still well above that recorded in 1905 or 1906. Rye has declined by more than 8,000 acres, or nearly 14 per cent., and its area is less than in any year since 1899. Beans, which showed a considerable increase in 1906, and again in 1907, have now declined by nearly 15,000 acres, but they still cover considerably more ground than in any recent year except 1907. The decrease in peas amounts to over 2,000 acres, or nearly 1½ per cent.

The details of the cereal crops are given in the following table :—

Crop.	1908.	1907.	Increase or Decrease.	
			Acres.	Per cent.
Wheat	1,626,733	1,625,445	+ 1,288 + 0·1
Barley	1,667,437	1,712,094	- 44,657 - 2·6
Oats...	3,108,918	3,122,898	- 13,980 - 0·4
Rye	52,744	61,211	- 8,467 - 13·8
Beans	295,012	309,730	- 14,718 - 4·8
Peas...	163,751	166,136	- 2,385 - 1·4

Among other crops decreases are likewise almost general, the only instances to the contrary being potatoes, lucerne, and small fruit. Potatoes show an increase of over 13,000 acres,

or nearly $2\frac{1}{2}$ per cent., thus recovering most of the loss of 17,000 acres noted last year. The area under turnips and swedes, which has decreased almost continuously for many years past, shows a decline of 12,000 acres, and is the smallest on record. The area devoted to mangold, which, on the other hand, has increased in recent years, has now declined by over 22,000 acres, or 5 per cent. Vetches or tares show the largest decline, both actual and relative, in this group, and the decrease of 28,000 acres, or over 18 per cent., brings the area under this crop to the lowest figure since the returns were first collected. Lucerne shows an increase of 1,400 acres, or rather more than 2 per cent., and the figure for this crop is the highest recorded.

The area under Small Fruit has steadily increased since 1897, and this year there is a further increase of 2,700 acres, or over 3 per cent. Hops, on the other hand, have declined almost regularly since 1885, and now exhibit a further decrease of no less than 6,000 acres, or nearly $13\frac{1}{2}$ per cent. Cabbage and kohl-rabi, rape, and the aggregate of minor crops, have also declined considerably.

The green and other crops are summarised in the following table :—

Crop.	1908.	1907.	Increase or Decrease.	
			Acres.	Per cent.
Potatoes	562,105	548,920	+ 13,185	+ 2·4
Turnips and swedes ...	1,550,897	1,562,978	- 12,081	- 0·8
Mangold	427,772	450,053	- 22,281	- 5·0
Cabbage and kohl-rabi ...	86,375	95,583	- 9,208	- 9·6
Rape	86,495	91,272	- 4,777	- 5·2
Vetches or tares ...	126,083	154,056	- 27,973	- 18·2
Lucerne	65,157	63,795	+ 1,362	+ 2·1
Hops	38,916	44,938	- 6,022	- 13·4
Small fruit	84,873	82,175	+ 2,698	+ 3·3
Other crops ...	115,405	121,868	- 6,463	- 5·3

The area returned as reserved for hay shows on the whole a decline of less than 5,000 acres, an increase of over 13,000 acres in the case of permanent grass being more than counterbalanced by a decrease in the case of clover and rotation grasses. Of the area for grazing there has been a decline of more than 51,000 acres among the clover and rotation grasses, but permanent grass has increased by nearly 125,000 acres.

Crop.	1908.	1907.	Increase or Decrease.	
			Acres.	Per cent.
Clover and rotation grass—				
For hay	2,232,353	2,250,319	- 17,966	- 0·8
Not for hay	2,189,234	2,240,642	- 51,408	- 2·3
Total ...	4,421,587	4,490,961	- 69,374	- 1·5
Permanent grass—				
For hay	4,949,879	4,936,651	+ 13,228	+ 0·3
Not for hay	12,465,990	12,341,233	+ 124,757	+ 1·0
Total ...	17,415,869	17,277,884	+ 137,985	+ 0·8

Among live stock horses and cattle have both declined, but sheep and pigs each show a considerable increase. From the next table it will be seen that there has been a slight increase in the number of horses used for agricultural purposes (including mares kept for breeding), but that, on the other hand, there has been a large decrease in the number of unbroken horses of one year and above. This was to be expected from the considerable decrease in the number under one year returned last year. The last-named category this time stands at practically the same figure as in 1907, and the total decrease of horses is nearly 11,000.

Horses.	1908.	1907.	Increase or Decrease.	
			Number.	Number.
Horses used for agricultural purposes	1,119,324	1,115,927	+ 3,397	+ 0·3
Unbroken horses—				
One year and above	299,809	313,952	- 14,143	- 4·5
Under one year	126,538	126,490	+ 48	+ 0·0
Total ...	1,545,671	1,556,369	- 10,698	- 0·7

The considerable decrease recorded last year in the number of cattle under two years is reflected in this year's returns, the number of two years and above being less by over 17,000, and the number of one year and under two by nearly 25,000. There has this year, however, been a satisfactory increase of nearly 31,000, or more than 2 per cent., in the number of cattle under one year. The number of cows and heifers in milk or in calf has again increased.

Cattle.	1908.	1907.	Increase or Decrease.	
	Number.	Number.	Number.	Per cent.
Cows and heifers—				
In milk	2,197,763	2,198,213	- 450	- 0·0
In calf, but not in milk ...	566,017	561,033	+ 4,984	+ 0·9
Other cattle—				
Two years and above ...	1,371,688	1,388,941	- 17,253	- 1·2
One year and under two ...	1,415,483	1,440,414	- 24,931	- 1·7
Under one year ...	1,354,183	1,323,466	+ 30,717	+ 2·3
Total	6,905,134	6,912,067	- 6,933	- 0·1

There are considerable increases in the number of sheep under each head, the largest, actually and relatively, occurring in the case of those of one year and above (excluding breeding ewes), and the total exceeds 27,000,000 for the first time since 1899. The number of ewes kept for breeding is the largest recorded since this class was first separately distinguished in the returns in 1893, whilst the number of other sheep under one year is greater than in any year since the returns were first collected, with the exception of 1868, when it was just over 11,000,000 and in 1891 when the number was 10,946,000. The total increase this year is 924,000, or 3½ per cent.

Pigs show an increase on the whole of nearly 187,000, or rather more than 7 per cent. The increase is wholly in pigs other than sows kept for breeding, the latter having declined by nearly 11,000.

Sheep.	1908.	1907.	Increase or Decrease.	
	Number.	Number.	Number.	Per cent.
Ewes keep for breeding ...	10,489,089	10,277,140	+ 211,949	+ 2·1
Other sheep—				
One year and above ...	5,632,767	5,193,597	+ 439,170	+ 8·5
Under one year ...	10,917,874	10,644,718	+ 273,156	+ 2·6
Total	27,039,730	26,115,455	+ 924,275	+ 3·5

IMPORTS OF GRAIN IN THE CEREAL YEAR, 1907-8.

The close of the cereal year, which may be reckoned as extending from 1st September to 31st August, affords a convenient opportunity for considering the extent to which this country has been dependent on the Colonies and on

foreign countries for grain to supplement the home production of 1907.

The yield of wheat in the United Kingdom in 1907 amounted to 7,066,000 qrs., which was about 500,000 qrs. less than that produced in 1906, and the imports for the cereal year 1907-8 were also less than those of the previous year. In 1906-7 the quantity received was 94,737,000 cwts., while in the year 1907-8 which has just ended it was 91,555,000 cwts. Converting these figures into quarters (of 480 lb.), the total supply of home and foreign wheat was 28,429,000 qrs. in 1907-8, as compared with 29,682,000 qrs. in 1906-7. To this must be added the imported wheat-meal and flour, viz., 13,389,000 cwts. in 1907-8 and 13,221,000 cwts. in 1906-7, quantities which may be taken as equivalent to 4,339,000 qrs. and 4,284,000 qrs. respectively of wheat grain, making with the imports and the home production a total available for consumption of 32,768,000 qrs. of wheat in 1907-8 and 33,966,000 qrs. in 1906-7. Exclusive of stocks carried over, the aggregate imports and home production of wheat, including wheat-meal and flour, have been as follows during the last five years :—

	Quarters.
1903-04	34,030,000
1904-05	32,796,000
1905-06	34,283,000
1906-07	33,966,000
1907-08	32,768,000

On the whole it will be seen that the amount available for consumption has shown no tendency to increase during the past five years.

With regard to the countries contributing to the supply, the receipts from each of the principal sources are given in the following table :—

Country of Export.	Thousands of Cwts.			
	1907-08.	1906-07.	1905-06.	1904-05.
India	10,480	14,613	11,743	29,083
Russia	4,455	12,843	18,377	28,823
Argentina	28,128	22,179	22,890	24,085
United States	25,273	20,319	17,917	4,558
Canada	13,578	11,085	11,177	3,547
Australia	6,264	7,769	7,488	12,758

The Argentine Republic again occupied the position of principal exporter to this country and furnished on this occasion a larger quantity than in any previous year. The second place was taken by the United States and the third by Canada. The larger receipts from these three countries compensated to a considerable extent for the shortage from Russia, and prevented any material dearth in the supply—a contingency which was at one time considered not improbable. The possibility, however, of a demand greater than the supply had a material effect on prices, which began to rise in May, 1907, and were maintained on the whole at a higher level than in any year since 1897-8.

The average price of imported wheat was 36s. 1½d. per qr. in 1907-8 compared with 30s. 5d. in 1906-7 and with 36s. 3½d. in 1897-8. Home-grown wheat participated in the general rise, as will be seen from the following table, which shows the average prices of British wheat, barley and oats per quarter, computed from the weekly averages of corn returns during each of the harvest years ending 31st August, 1898 to 1908. The quantities given in the table are the quantities returned as sold from which the averages are calculated.

Harvest Years.	Prices.			Quantities.		
	Wheat.	Barley.	Oats.	Wheat.	Barley.	Oats.
1897-98 ...	36 2	26 11	18 3	2,534,224	3,339,842	599,666
1898-99 ...	26 0	26 1	17 3	3,498,515	3,629,760	777,676
1899-1900 ...	26 4	25 2	17 4	3,255,654	3,355,241	722,859
1900-01 ...	27 1	25 0	18 1	2,463,341	3,109,149	684,956
1901-02 ...	28 4	25 11	20 4	2,451,275	3,176,599	698,840
1902-03 ...	26 5	23 4	17 8	2,386,017	3,151,337	1,104,660
1903-04 ...	27 2	21 10	16 4	2,129,448	2,780,473	1,132,086
1904-05 ...	30 7	24 6	17 0	1,746,927	3,141,058	1,178,154
1905-06 ...	28 9	24 2	18 5	2,940,263	3,202,613	940,015
1906-07 ...	28 1	24 5	18 4	2,830,991	3,376,615	1,219,419
1907-08 ...	32 9	25 8	18 2	2,944,256	3,564,908	1,530,848

The United States is the principal exporter of wheat flour to this country, 10,124,000 cwts. being received from this source during the past twelve months. Canada sent 1,542,000 cwts., but the importation from France and Austria-Hungary fell off. The average price was 10s. 1½d. per cwt., against 9s. 6d. last year.

The imports of barley were materially less than for some years past, chiefly on account of diminished receipts from Turkey and the United States. In the aggregate they amounted to 17,465,000 cwts. compared with 19,469,000 cwts. in 1906-7 and 20,314,000 cwts. in 1905-6.

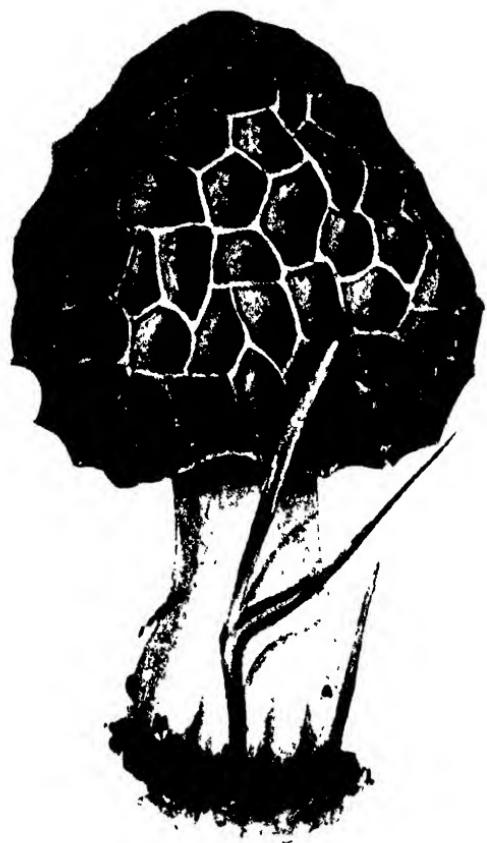
Oats, on the other hand, which fell to a somewhat low figure in 1906-7, showed a recovery, owing to a larger supply from Germany and some other countries which do not usually figure in the returns to any important extent. The imports from the United States and Canada were insignificant, being only 227,000 cwts. compared with 6,654,000 cwts. two years previously. The average price of oats was 6s. per cwt.

Maize, which was imported into this country in larger quantities in 1906-7 than for five years previously, again declined, and the receipts were less than in any year since 1894-5, when the imports only amounted to 24,000,000 cwts. Russia, Roumania, and the United States all sent less, and the deficiency was not made up by Argentina.

The aggregate supplies of the principal cereals in each of the past eleven years are given below :—

Harvest Year.	Millions of Cwts.				
	Wheat.	Wheat-flour.	Barley.	Oats.	Maize.
1907-8	91.6	13.4	17.5	13.2	39.5
1906-7	94.7	13.2	19.5	10.9	51.7
1905-6	94.6	14.4	20.3	16.0	47.1
1904-5	105.1	10.9	21.0	17.2	42.3
1903-4	93.1	19.1	31.9	15.2	47.6
1902-3	85.1	19.2	25.7	16.6	41.6
1901-2	74.7	19.1	23.1	16.7	47.2
1900-1	71.2	23.3	18.7	22.1	55.8
1899-1900	65.0	21.6	15.2	19.8	57.7
1898-9	67.0	22.9	22.9	14.9	57.5
1897-8	66.4	20.0	20.3	15.4	55.6

It is interesting to notice that it is only in the case of wheat that any marked increase in the supply can be observed, in fact in several instances the average for the last five years is less than that of the preceding period.



THE COMMON MOREL.

EDIBLE FUNGI.

I.—THE COMMON MOREL (*Morchella esculenta*, L.)

This is the best of the few edible fungi which occur in considerable abundance during late spring and early summer, and, further, it possesses the advantage of having no ally of a deleterious nature with which it may be confounded. The accompanying figure represents the typical form of the fungus. It is not very variable either in form or colour. Both the cap and stem are hollow, and the surface of the cap bears a number of prominent ridges joined together to form an irregular network. This latter character at once distinguishes the Morels from all other British fungi except the "Stinkhorn" (*Phallus impudicus*, L.), which differs in the long stem springing from a large gelatinous sheath or volva partly buried in the ground and in the penetrating, abominable smell.

Two or three other species of Morel also occur in this country, one of them being much larger than *M. esculenta*. They are rare, however, but are as edible as the one under consideration.

All grow in spring and early summer, and are found especially on chalky or clayey soil, amongst grass, in orchards, hedgerows, &c.

The following method of cooking Morels is given by Dr. Cooke, and the testimony of others corroborates his statements.

For a ragoût the fungi are cleaned and wiped to remove all traces of sand, cut in two—both cap and stem—then placed in a stewpan with butter, and set over a clear brisk fire; when the butter is melted, squeeze in a little lemon-juice, give a few turns, and add salt, pepper, and a little grated nutmeg. Cook slowly for an hour, adding at intervals small quantities of beef gravy or jelly broth. When done, thicken with yolk of eggs.

Another method which may be adopted is as follows:—The Morels are first washed and wiped (a process which should never be omitted) and then placed in a saucepan on the fire with butter, salt, pepper, and a small bundle of herbs. Allow them to simmer together, and add a little flour; soften with good beef gravy. Let them cook and reduce, over a gentle fire, then remove the bundle of herbs. Fry some breadcrumbs in butter, then beat up the yolks of three eggs, add a pinch of powdered

sugar, mixed with the Morels, and pour the whole over the fried breadcrumbs, which have been previously put into a dish.

Morels dry readily if placed in a current of air, and in this way may be kept for seasoning soups, &c., during the winter.

A large number of specimens of diseased or insect-infested crops have been submitted to the Board during the past few weeks, gooseberry plants affected with

Notes on Insect, Fungus, the European mildew being numerous.

and other Pests.* **MOTHS.**—*Wax Moth*.—Chrysalids from

Newbury proved to be those of the Wax Moth, which is sometimes harmful in beehives. The moth flies in the evening ; if it fails to enter the hive, eggs may be laid in chinks and crevices, but the sides and bottom of the frames are where the eggs are commonly laid, and it has been stated that a favourite place is as near the brood combs as possible. The caterpillars on hatching burrow through the comb, and full-grown ones pupate under cover of a cocoon. It is the experience of beekeepers that the moth is only to be feared : (a) Where the colony is a weak one and unable to cover the combs ; (b) where the hive is queenless ; or (c) where combs are allowed to remain without attention. Combs or pieces of comb should not be allowed to lie about, as they are used by the moths for egg-laying. Spare combs should therefore be kept in protected places. The signs of infestation are the presence of caterpillar excrement on the floor boards and glistening webs spun by the caterpillars. The coverings of the hive and the floor-boards should be examined in spring and autumn, and any caterpillars found should be destroyed. Italian bees are more able to protect themselves than the black bee.

Clear-wing Moth attacking Poplar.—A poplar near Leeds was found to be attacked by the larvæ of the Hornet Clear-wing Moth (*Sesia apiformis*). Twenty-six bores were counted in the stem of the poplar, and it was observed that the old bore holes were mostly inhabited by spiders. The hornet clear-wing is $1\frac{1}{2}$ to $1\frac{3}{4}$ in. in spread of wing and $\frac{3}{4}$ to 1 in. in

* Notes on insect, fungus and other pests, dealing with the specimens submitted to the Board for identification, and their apparent prevalence, will appear in this *Journal* month by month. The notes commenced with the issue for June, 1907.

length, the body being dark brown in colour and bearing three pairs of yellow spots, certain of the abdominal segments being bright yellow. The wings are transparent, with borders of rusty red. The caterpillars are dirty white in colour and bear sixteen legs, the head being reddish brown. Eggs are laid by the moths in July in cracks in the bark, the caterpillars hatching in July and August. After passing two winters in galleries in the timber they pupate in May of the third year, the moths appearing in June and July. According to Schlich, the larva prefers trees under twenty years of age, but may infest older trees. The caterpillars are chiefly injurious in nurseries and avenues.

Mining Moth in Apple Leaves.—Specimens of apple leaves from Westbury (Wilts) were infested by the small Tineid moth, *Lyonetia clerkella*, L. The eggs are laid on the leaves, typically a single one to a leaf. A winding mine is made by the caterpillar in the mesophyll of the leaf, and if the leaf is held up to the light the tiny caterpillar may be seen, with the aid of a lens, at the end of the mine. There are several broods in the year. If at all practicable—*i.e.*, if the mines are not on many trees or out of reach—the affected leaves should be hand-picked and burnt.

Raspberry leaves from near Chesterfield were infested by mining caterpillars, and in this case also the affected leaves must be removed and burnt. Where attack is feared spraying with paraffin emulsion might be tried as a deterrent against egg-laying by the moths.

A caterpillar very closely resembling a twig was taken from a rose tree near Chingford and forwarded to the Board. It proved to be the larva of the common Swallow Tail Moth (*Uropteryx sambucaria*, L.), an insect that is not usually very troublesome.

Other moth pests received were the Pith Moth (*Laverna atra*), on apple specimens from Swanage (see Leaflet No. 90); caterpillar of the Eyed Hawk Moth (*Smerinthus ocellatus*) from Sittingbourne (see *Journal*, July, 1908, p. 213). A severe attack by Winter Moth caterpillars was reported from Southwell.

BEETLES.—*Beetle on Willows.*—Specimens of willow were sent from Wetherby, the wood of which was found to be tunnelled by the grubs of the beetle *Cryptorrhynchus lapathi*, L.

This insect is harmful both in the adult stage as beetle, when it bites the bark of young shoots, and as grub, when it tunnels the wood, sometimes to the very pith. This is the most harmful stage, and the affected shoot may be completely ringed by the grub galleries. Alder (*Alnus*) is the most commonly infested tree, but the grubs have also been found infesting various willows—*Salix caprea*, *S. viminalis*, *S. purpurea*, *S. triandra*—and in rarer cases poplar and birch. The adult beetles issuing in May or a little later may be combated by shaking them off the plants on to tarred boards or on to sheets spread for the purpose. As the beetles rest on alder stumps or stems they are not easily seen owing to their protective colouration. Signs of attack are discoloured bark at the place of egg-laying and first attack, falling in of the bark at the place of boring, and the brown bore dust which is pushed to the outside. Adult beetles may be expected at the end of July, so that infested branches should be cut and burned with the enclosed brood of grubs.

Beetles in Malt.—Specimens of beetles and grubs from Manningtree, found in a heap of English barley malt, were identified as *Tribolium ferrugincum*, a species which, with its very close ally *T. confusum*, often proves very troublesome to cereal and other seeds and to stored products, especially those of a farinaceous nature, such as flour, meal, grain, peas, beans, &c. The pale-coloured eggs are laid on the food or other material, or in cracks or crevices in the receptacle containing the product. The eggs hatch into larvæ, and in favourable temperatures the development is soon completed. The new generation proceeds to egg-laying and the number of beetles soon becomes large. If the infested grain be placed in an air-tight box and fumigated with bisulphide of carbon the pests will be destroyed. Fumigation may be carried out in the manner described in Leaflet No. 150.

Beetle on Raspberries.—Specimens of raspberry buds infested with the beetle *Byturus tomentosus* were received from Twickenham. This beetle in its adult stage attacks the blossom, while the grubs infest the fruit. Where the beetles are present in numbers they should be jarred off the plants into a vessel containing paraffin or on to a tarred board. When full fed the grubs become pupæ, which pass the winter either in the soil

below the plants or in the rough bark of the raspberry canes. Many of the pupæ, therefore, may be destroyed by burning prunings and old canes in the winter, and by deeply burying the surface soil.

Other cases of beetle infestation occurred in swedes from Chester, which were attacked by the grubs of the Turnip Gall weevil (*Journal*, June, 1908, p. 201); and in peas from Nottingham, damaged by the larvæ of the Pea Beetle (Leaflet No. 150). Specimens of the "Death Watch" beetle, *Anobium domesticum* (*Journal*, September, 1907, p. 352), were received from Manchester; grubs of the garden chafer, *Phyllopertha horticola*, (Leaflet No. 25) from Limerick; the Pigmy Mangold Beetle (*Journal*, July, 1908, p. 274) from Westbury and Liskeard; larder beetles, *Dermestes lardarius* (*Journal*, June, 1907, p. 160), from Darlington; and *Otiorrhynchus* weevils on currants from Norwich (see Leaflet No. 2).

FLIES.—Lime twigs from Nairn were infested by the larvæ of one of the gall midges (*Cecidomyia*), the midge in question giving rise to little galls, in which the maggots live, pupation also taking place in the gall. Shoots that are attacked should be removed and burnt. Chrysanthemums from Tooting were infested with the maggots of the fly *Phytomyza geniculata* (*Journal*, December, 1907, p. 556). As a deterrent to egg-laying a spray composed of 1 oz. bitter aloes, 2 oz. soft soap and 6 gallons of water should be used. Other pests were the cabbage root fly, *Phorbia brassicæ* (Leaflet No. 122), from Kidderminster, Runcorn, Dover and Chester; mangold fly (Leaflet No. 5) from Salisbury and Brightstone (Isle of Wight); celery fly (Leaflet No. 35) from Nottingham; frit fly (Leaflet No. 202) from Chichester and Newcastle-on-Tyne; pear midge (Leaflet No. 53) from York and Great Chesterford (Essex).

SAWFLIES, &c.—Leaves of willow from Portree were found to be galled by the larvæ of *Nematus gallicola*, Steph. The galls are very common on *Salix alba* and *S. fragilis*, and are popularly known as bean galls. Other pests were Pear Sawfly (see Leaflet No. 62) from Aberystwyth; and Apple Sawfly (Leaflet No. 205), from Barnet and Wisbech.

APHIDES, &c.—*Aphis on Lettuce Roots*.—Specimens of lettuces from Stroud were found to have their roots smothered with aphides of a dirty greenish-yellow colour, covered with a white

woolly secretion resembling that of woolly aphides. These root-aphides were *Pemphigus lactucarius*, Pass., a species which is occasionally responsible for much damage to lettuce plants. If ants are found in proximity to infected lettuces they should be destroyed, as they may serve to distribute the aphides by carrying them from plant to plant. On small areas the injection of carbon bisulphide into the soil might prove useful (see foot of p. 3, Leaflet No. 10). As soon as the affected lettuces have been cut the soil may be given a moderate dressing of lime or gas-lime, which should be dug in and the ground left without a crop for six weeks. Until cut the plants may be well watered at intervals with liquid manure, and the ground, if not too extensive, should receive a good application of soapy water or other preparation fatal to aphides and harmless to plant life. In any case frequent watering should be practised, and if it is possible to irrigate the land for a few hours the pests will probably be killed.

Oat aphides.—Specimens of oat panicles from Inverness were found to be swarming with Oat Aphides (*Aphis avenæ*. Fab.). This pest is not often destructive, but may at times occur in large numbers during prolonged warm weather and do much damage. In the case under consideration it was stated that the oat crop was "quite full of insects—from four to six on each grain of oats, and the grains on which they are seem to have lost all nourishment, as they turn out quite empty and light." In such cases remedial measures are, unfortunately, hardly practicable, as the crop could only be sprayed with difficulty by hand. This might, however, be done on a small area of valuable corn intended for seed purposes if taken in time before permanent damage were done. When the damage is serious the crop might be cut green, though a few hours rain would be likely to wash it clean.

Aphis on Scotch Pine.—From' Sherborne and Salisbury specimens of young Scotch pine were received, and found to be infested with the *Chermes* of the pine, this pest giving a woolly appearance to the shoots. There is some doubt as to the complete life cycle of this species of aphis, but the stage considered is almost certainly one in a complex life cycle of a *Chermes* with alternating generations and both primary and intermediary host trees. The best treatment would be spraying

with dilute paraffin emulsion. With the allied *Chermes* of spruce and larch the best results are obtained by spraying in the winter with an emulsion composed of 3 lb. of soft soap dissolved in 2 quarts of boiling water, adding 1 pint of paraffin while still hot and churning thoroughly. For use this should be diluted with 5 gallons of water. For summer treatment, when the trees are in active life, the emulsion should be more diluted.

Specimens from Oakham were infested with the galls caused by the aphis *Pemphigus bursarius*, Koch ; plums from London with Plum Aphides (see Leaflet No. 104) ; aphides on gooseberries were received from Inverurie, Orpington, Chelsfield and Southampton ; *Aphis rumicis* or Bean Aphid on broad beans from Plymouth, Tavistock and Saltash (two) ; Spruce Gall Aphid on spruce shoots from Dunfermline; and Larch Aphid on larch from Stevenage.

Scale on Roses.—Rose specimens from Falmouth were infested with the rose scale, *Diapsis rosæ*. Badly diseased branches should be removed immediately and burnt. In August, when the larvæ appear, the trees should be sprayed several times with soft soap and quassia. If this is not effectual, the branches should be carefully washed in February with a paraffin emulsion, but for roses paraffin must be used sparingly.

OTHER PESTS.—*Pear Leaf Blister Mite*.—Late in June the Board received from Hunstanton specimens of pear leaves infested with the Pear Leaf Blister Mite, *Phytoptus (Eriophyes) pyri*. The blisters on leaves attacked by this mite vary in colour ; they may be green, red, red-green, and later black or brown. They are sometimes confused with the spots on the leaves due to a fungus, but the mite galls can be distinguished, with the assistance of the lens, by a small hole on the under side of each. The mite is microscopic, but its general appearance can be fairly well seen from the figure of the black currant mite shown in the Board's Leaflet No. 1. Badly infested leaves should be hand-pulled and burnt. In America the mite is combated by spraying when the leaves fall, presumably with a view to killing any mites which at this time have not passed into hiding. Winter is passed by the mites under the outer bud scales of the buds, and here it is possible, perhaps, for the paraffin emulsion to reach them. Spraying trees early

in spring when the buds are opening out and the mites are exposed would probably account for many of the mites. A spray suggested is composed of 2 lb. of sulphur, 25 lb. of soft soap, and 50 gallons of water ; or the lime and sulphur treatment recommended in the revised Leaflet No. 1 against the black currant mite could be tried if practicable. The mite has recently been found infesting the fruit and causing it to fall prematurely ; attacked fruit should be gathered and burnt. The pest is believed to spread very slowly, but one of the trees at Hunstanton (a "Marie Louise"), which bore an excellent crop in 1906, and then appeared to be unaffected, was observed to be going wrong just as the fruit was setting in 1907, and all the fruits but one dropped off. This has again occurred in the present season. A tree of the same age and variety has never borne blossoms, and this tree seemed almost untouched by the mite in the spring of 1908, but by the middle of August appeared to be nearly as bad as its neighbour side by side with it.

Oats from Newcastle-on-Tyne were badly infested with eel-worms, *Tylenchus devastatrix* (Leaflet No. 46 and *Journal*, July, 1907, p. 224) ; specimens of limes from York and Boscombe were attacked by gall mites (see *Journal*, July, 1908, p. 277) ; gooseberries from Stockbridge, West Wickham (Kent) and Southampton with Red Spiders (Leaflet No. 41) ; and ivy from Oakham with the Red Spider of the ivy : this pest may be very destructive.

FUNGI.—*Damping off of Seedlings*.—An inquiry as to the damping off of seedlings was received from Thornton Heath, (Croydon). The term "damping off" is applied to a disease of seedlings, characterised by the falling over and dying of the plantlets, due to the destruction of the fundamental tissue of the stem just above ground by a fungus called *Pythium de Baryanum*. Seedlings of cruciferous plants are more especially attacked, but the fungus also attacks maize, millet, clover, mangold and cucumber. Conidia, sporangia and sexually produced oospores are formed by the fungus, but never in the tissues of the hosts, always on its surface, or on the adjoining soil, if sufficiently wet.

The conidia form one or two germ tubes almost immediately after they are mature, or, under certain circumstances, after a longer or shorter period of time, extending even to several

months. A second kind of conidia require a period of rest before germination takes place. The sporangia possess a single tube-like projection into which the protoplasm passes and forms a sphere at its tip, which breaks up into biciliate zoospores.

Both oospores and resting conidia remain on the ground and produce zoospores after a period of hibernation.

This disease only occurs where the ground is very wet and the light dull. If seed beds are formed where the drainage is good and a fair share of sunshine allowed, the fungus is completely held in check, as its reproduction and diffusion depend entirely on the constant presence of water in the soil.

Diseased Peas.—Peas from Bristol and Manchester were attacked by a root fungus, *Thielavia basicola*, Zopf. When once the plants are infected it is very difficult to arrest this disease. Watering with a solution of sulphate of potash checks the spread of the fungus in the soil; a dressing of soot is also useful. When the diseased crop has been removed the infected soil should be dressed with quicklime.

Pea plants from Falmouth were infested with pea spot, caused by the fungus *Ascochyta pisi*, Libert. Failure of the plants, however, was not due to the fungus, but to root troubles, the exact nature of which could not be determined.

Gooseberry and Currant Leaf-Spot.—Black currant specimens from St. Mary Cray and Norwich, and gooseberry specimens from Fakenham and Shanklin, were found to be infested with the Gooseberry and Currant Leaf-spot, *Gloeosporium ribis*, Mont. Injured leaves fall early in the season, and as the disease usually increases in intensity each succeeding season, the bushes are weakened and eventually killed if nothing be done to arrest the disease.

It is important that all diseased leaves should be collected and burned. During winter the ground under and around the bushes that have been infected should be turned over and dressed with lime. In the next spring, just at the time when the leaf buds are expanding, a thorough spraying with a solution of potassium sulphide (liver of sulphur), 1 oz. in 4 gallons of water, should be given. A second spraying should be given after an interval of three weeks.

Diseased Roses.—From Westbury (Wilts) and Longfield

(Kent) specimens of rose leaves were received infested with Rose Rust (*Phragmidium subcorticatum*, Winter), and an inquiry as to the best method of combating this disease was received from King's Lynn. The orange-coloured patches observed in summer give place as the season advances to black spots, these consisting of masses of resting spores. To prevent a recurrence of the attack all affected leaves should be collected and burned in the autumn. If rust spots appear on the wood, the patches should be treated, as soon as noticed, with a solution consisting of equal parts of methylated spirit and water. This should be carefully applied with a piece of sponge. In spring, when the leaves are expanding, the bushes should be sprayed with a solution of potassium sulphide (1 oz. to 3 gallons of water).

Specimens from Tynemouth and Heathfield were affected with Rose Mildew (*Sphaerotheca pannosa*, Lév.), an exceedingly common parasite on almost all kinds of roses. This mildew may be kept in check by spraying the bushes with a very dilute solution of sulphuric acid, 1 oz. in 5 gallons of water. Diseased leaves should be collected and burned in the autumn.

Oak and clematis specimens from Heathfield were attacked by other mildews of the same family as *S. pannosa*.

Mildewed Oak Leaves.—Specimens of oak leaves from Exbourne (Devon) were covered with a so-called "white efflorescence," due to the presence of one of the *Erysiphaceæ* or mildew fungi. The exact species could not be determined until the perithecia or autumn fruits developed, but the fungus was in all probability a species of *Microsphaera*. The mildew is exceedingly abundant this season in many parts of the South of England.

"*Shot-Hole Fungus*."—Peach leaves from Ryde were injured by the "shot-hole fungus," *Cercospora circumscissa*, Sacc. This well-known pest attacks the leaves of peach, apricot, cherry, almond and nectarine. Small circular patches of the leaf, bearing conidia on one or both surfaces, become dry, contract and drop away, leaving a hole in the leaf. Numerous holes are often present on a single leaf, giving it the appearance of being riddled with small shot. Such diseased leaves fall early in the season, before the formation of wood has been completed, and there is in consequence a poor crop the following season. The young branches, and even the fruit of the peach,

are sometimes attacked. The disease often spreads quickly, being favoured by the dispersion of the dropped-out portions of the leaf-bearing conidia.

The peach trees should be sprayed with an ammoniacal solution of copper carbonate—1 oz. carbonate of copper and 5 oz. carbonate of ammonia in about a quart of hot water, diluted with 16 gallons of water. Spraying should take place the first time just when the leaves are expanding, and thereafter be repeated at intervals. Bordeaux mixture should not be used for peach or almond, as the leaves, and even young shoots, are injured by dilute solutions.

Diseased Cabbages.—From Haslemere the Board received specimens of cabbage leaves which proved to be covered with discoloured circular patches caused by *Sphaerella brassicaecola*, Sacc. Diseased leaves should be removed and burned. This is important, as not only will the progress of the disease be checked by so doing, but the soil will not be infected, as it would be if the diseased leaves were allowed to rot on the land.

Diseased Grapes.—A bunch of grapes from Blairgowrie was affected with *Cladosporium Roesleri*, Catt. All diseased fruit should be collected and burnt, as numerous minute sclerotia are present which will give rise to spores next season. When the vine is resting, all the branches and also the border should be drenched with a solution of 1 lb. of sulphate of iron in 3 gallons of water.

Other specimens.—A number of other specimens comprised whitethorn infested by *Podospora oxyacantha*, De Bary; apples from Maidstone, Ross, Westbury (Wilts), Farnborough, Baldock and Garstang affected with Apple Scab (Leaflet No. 131); apple leaves from London affected with Apple Tree Mildew (Leaflet No. 204); apple specimens from Garstang showing signs of Apple Canker (Leaflet No. 56); and plums from Bewdley attacked by Brown Rot (Leaflet No. 86). The ripe fruit of loganberries from Lewes bore *Botrytis cinerea*, the spores of which alight on sugary exudation from the berries and quickly cover them with a mass of mould. Gooseberries from Bideford, Blandford, Horley, King's Lynn, St. Mary Cray, Etchingham (Sussex), Ipswich, Maidstone, Heathfield, and Horsmonden were affected with European Gooseberry Mildew (see Leaflet No. 52); timber from Hemel Hempstead

was attacked by Dry Rot (Leaflet No. 113) ; tomatoes from Taunton were infested by "sleepy disease" (Leaflet No. 116) ; tomatoes from Bletchley with Leaf-curl (Leaflet No. 164) ; turnips from Chester with "Finger-and-Toe" (Leaflet No. 77) ; mangolds from Abergele with Heart Rot (Leaflet No. 144) ; potatoes from Chester, Norwich and Dalston (Cumberland) with Potato Disease (Leaflet No. 23) ; and potatoes from Reading, Baldock, Norwich, and Manchester with Potato Scab (Leaflet No. 137).

The action taken by the Board of Agriculture and Fisheries under the Small Holdings and Allotments Acts up to the

Report on Small Holdings. 30th of June, 1908, is described in an interim report by the Small Holdings Commissioners (Cd. 4245. Price 5d.),

from which it appears that over 19,000 persons have applied for small holdings of a total acreage of over 300,000 acres. These applications are being considered by the committees and sub-committees of the county councils concerned. A large proportion of the applicants appear to be thoroughly suitable men, and the amount of capital they possess is greatly in excess of what was generally anticipated. Only in a very small percentage of cases is there any desire to purchase, and in the majority of cases the applicants do not ask for houses or buildings. This is probably due to the fact that most of them are men who are already resident in the country and who desire land within reach of their present homes.

The extent to which the original number of applications has been reduced after investigation varies in different part of the country. In the Isle of Wight practically the whole of the applicants are regarded as being likely to prove suitable tenants. In Cambridgeshire the applications of 865 persons for 8,203 acres were investigated, and the sub-committees have approved 673 applications for 5,080 acres. In some counties, on the other hand, mainly owing to the adoption of a somewhat narrow view as to the description of person who is entitled to take advantage of the Act, the sub-committees have ruled out a number of applications from village tradesmen, carriers, &c., who desired land as an adjunct to their present employment.

The Board thought it desirable, therefore, to issue a circular pointing out that the Act did not justify the adoption of such a course, and they have requested the councils concerned to reconsider such applications if they had been rejected on inadequate grounds.

Another circumstance which has caused the reduction of the applications is that in some cases councils have been able to act as intermediaries in arranging that applicants should obtain land direct from private landowners. If the applicant agrees to the adoption of this course the Board themselves offer no objection, and from the information they have received it is estimated that not less than 1,000 acres of land have been thus let in small holdings since the passing of the Act.

The inquiries which have been made have shown that a certain number of applicants have applied for more land than they can manage properly, and in many cases they probably did not expect to obtain the whole amount of their demand. Such applications have been reduced to the acreage which the sub-committee think suitable. In addition some applicants have failed to attend the local inquiries, and their applications have therefore been struck out, but where it has been shown that they were unable to attend owing to the hour at which the inquiry was held being inconvenient to them, or from some other satisfactory reason, they have been usually given another opportunity of being interviewed. A good deal of evidence has reached the Board that many applicants who have applied for particular pieces of land decline to take any other land if that cannot be obtained, and in such cases the Board have pointed out that the duty of the county council does not go beyond the provision of suitable land within a reasonable distance of the applicants' homes, and that councils cannot necessarily be compelled to provide the particular land applied for.

The majority of the county councils have now practically completed their local enquiries and are therefore in a position to know the approximate area of land required to satisfy the genuine demand. Many of them have already taken active steps to obtain land, and inquiries have been addressed to the local landowners asking whether they are in a position to let or sell suitable land to the council.

Up to the end of June the Board had received seventeen schemes for the provision of small holdings, thirteen of which have been approved. These seventeen schemes cover an area of 1,406 acres, and in addition, schemes relating to 647 acres have been provisionally approved.

It thus appears that rather over 2,000 acres of land have already been acquired under the recent Act, and in addition negotiations are in progress in many other counties. The Cheshire County Council are negotiating for a thirty-five years lease of 255 acres of crown land at Delamere and for land in the Wirral and other parts of the county. The Cornwall County Council have purchased at auction 146 acres near Bridgerule. The Holland County Council have agreed to buy a farm of 285 acres at Deeping St. Nicholas, and proposals for the acquisition on lease for twenty-one years by the Wilts County Council of 452 acres at Mere from the Duchy of Cornwall for letting to a co-operative association are now before the Board. The Bedfordshire County Council are negotiating for the letting of a farm of 300 acres to a co-operative society at Biggleswade.

In addition to the powers which are given to councils by the Acts of 1892 and 1907 for the purchase or hiring of land for small holdings, they are empowered by section 17 of the Act of 1892 to advance money to sitting tenants of small holdings to enable them to purchase their holdings. In consequence of the sale of the Penrhyn and Vaynol estates in Carnarvonshire sixty-eight of the tenants applied to the county council for advances to enable them to purchase their holdings, and sums amounting to £4,436 have been advanced by the council for the purpose.

A summary of the action taken in each county is appended to the report, together with copies of the various documents which have been issued by the Board relating to the Acts.

The Annual Report of the Intelligence Division of the Board of Agriculture and Fisheries will be issued this year in two parts. The first part, which has already

Report of the Intelligence Division. been published (Cd. 4274. Price, 5d.), deals with the work of the Commercial Control Branch under the Sale of Food

and Drugs Acts, the Merchandise Marks Acts, the Fertilisers and Feeding Stuffs Acts, and as regards the carriage of agricultural produce.

The report describes the steps taken with a view to the prevention of the importation and also of the sale in this country of adulterated dairy produce, &c. A few of the points dealt with are given below :—

As regards the law relating to the sale of milk, it is mentioned that comparatively few complaints have been received during this year from farmers, but an important deputation was received by Sir Edward Strachey, Bart., M.P., on behalf of the President of the Board, from the Central and Associated Chambers of Agriculture and various dairy farmers' Associations early in the year.

This deputation pressed for legislation making it compulsory on local authorities to resort to the procedure known as the "appeal to the cow," before instituting proceedings in respect of samples of milk found below the limits referred to in the Sale of Milk Regulations, 1901, and it was suggested that the "appeal to the cow" should take place within twenty-four hours of the time when the original sample was taken, and that regard should be had to the quantity of milk sent out by the cowkeeper on the date of the appeal, as compared with the quantity sent out on the date when the original sample was taken.

There is no doubt that an "appeal to the cow" conducted on these lines would often furnish valuable evidence on the question whether the original sample was adulterated, or genuine, though poor in quality, but it is difficult to see how the local authority conducting the appeal could ascertain the quantity of milk sent out of the dairy on any particular date, unless an elaborate system of keeping records of milk production under strict supervision were established.

It would also entail the maintenance of a large staff of expert inspectors, and in the cases where milk was sent from a distance it would involve the issue of directions by one local authority to another.

As regards the fixing of a standard of quality for milk, it is pointed out that the question whether it is desirable to prevent the sale of milk of poor quality is, in the main one, for the Public

Health authorities. There are, however, two considerations connected with this question which seem worthy of the attention of those interested in the sale of milk :—

(1) It is not desirable that the seller of milk of inferior quality should compete on equal terms with the seller of milk of normal quality, and

(2) Some local authorities make a rule of taking proceedings in every case where a sample of milk is found below the limits, and in any case the difficulty of deciding whether milk has been adulterated or is merely poor in quality is so great that it must frequently happen that sellers of poor milk are prosecuted for adulteration.

The present position, therefore, is that although the sale of poor milk is not prohibited, the sale of such milk is in practice penalised by the institution of criminal proceedings which, may or may not be successful, and it might be better for the milk seller that the sale of milk falling below a certain standard of quality should be prohibited, provided the prohibition were enforced by some means which did not involve criminal procedure.

The Fertilisers and Feeding Stuffs Acts require the consent of the Board before criminal proceedings can be taken, and the position of the Board in this connection is explained. It is considered that the Board would not be justified in concurring in a proposal to prosecute in any case in which their consent is required unless there was reason to believe that the offence was wilful or due to gross negligence.

It is obvious that as a general rule the proper remedy for damages caused by accident or ordinary carelessness is by civil proceedings, and the views expressed by the Departmental Committees who have dealt with this subject, the terms of the Act, and the statements made in the House of Commons at the time the Act was under discussion, would make it impossible for the Board to depart from this position.

Several inquiries had been undertaken during the year as to alleged offences under the Merchandise Marks Act, 1887, and some prosecutions have been instituted. One of these related to the sale of cider containing no apple juice. Representations were received by the Board from cider makers and others interested in the cider industry, to the effect that a liquid con-

coction devoid of apple juice was placed upon the market and sold as cider to the prejudice of the apple-growing and cider-making interests. Inquiries were instituted and samples of so-called cider were obtained from two manufacturers. It was found on analysis that these samples were composed entirely of sugar in solution, with chemicals, flavouring essences, and colouring matter, and that they contained no apple juice. Summonses were taken out under the Merchandise Marks Act, and the premises of the two manufacturers were entered under a search warrant. The information obtained by the execution of the search warrant confirmed the analysis of the sample. The defendants were each fined £5 and £20 costs.

A number of inquiries have been made with regard to the carriage of agricultural produce, and in many instances representations have been successfully made to the railway companies concerned.

The Board of Agriculture and Fisheries have, with the consent of the Treasury, made a grant to the Agricultural Organisation Society under Section 39 (4) of the

Grant to the Small Holdings and Allotments Act, Agricultural Organisation Society. 1907. The amount of the grant will be £1,200 per annum, payable quarterly, for a period of three years from the 1st April, 1908, provided that the income of the Society from subscriptions and donations in each year is not less than £1,200. In the event of the income of the Society exceeding that sum, the grant to be made by the Board will be increased by a corresponding amount with a maximum of £1,600. The grant in any one year to be calculated upon the income of the Society from subscriptions and donations of the previous year. The conditions on which the grant is made are as follows :—

(1) The work of the Society shall be confined to organisation and auditing only. By the term organisation is to be understood :—The advocacy of the adoption of co-operative methods by the agricultural classes for their benefit; the giving of advice and instruction as to the application of the principles of co-operation to industries for the betterment of the rural population; the giving of advice and assistance to co-operative

societies in the conduct of their affairs, but especially as regards observance of rules, statutory obligations, arbitrations, settlement of disputes, keeping and auditing of accounts, finance, and business matters.

(2) The rules of the society shall be so framed as to secure that its business shall be conducted by a president and a committee of management consisting of twenty-four members of which six shall be nominated by the Board and two by the National Poultry Organisation Society.

(3) The society shall appoint at least three organisers for the promotion of co-operation in connection with the cultivation of small holdings or allotments, of whom one shall be conversant with the organisation of co-operative societies for the production and sale of poultry and eggs. Two of these organisers shall give their whole time to their duties and be paid a salary not exceeding £300 per annum.

(4) The organisers shall, as far as possible, endeavour to visit all societies for the promotion of co-operation amongst small holders which are affiliated to the society in their respective districts, in order that all necessary advice and instruction in matters of co-operative organisation may be given, provided always that in the case of societies requiring such visits from organisers necessitating special expenditure and loss of the organiser's time, such societies may be required to pay such a sum therefor as the committee of management may deem expedient. The committee shall exercise its discretion as to the extent to which, and the terms subject to which, the services of organisers shall be given to non-affiliated societies.

(5) All applications to the Board relating to matters of co-operative organisation shall be referred to the society. The officers of the Board will encourage such enquiries as much as possible.

(6) The Board shall have the right to make use, free of charge, of any model rules, pamphlets or other publications issued by the society which the Board may consider serviceable to them in connection with the administration of the Act.

(7) A separate account shall be kept of the expenditure incurred by the society in connection with the promotion of co-operation amongst small holders to which shall be charged

such a sum as the Board may approve as representing the proportion of the general expenditure of the society which is applicable to work for which a grant can be made by the Board under the Act.

(8) The representatives of the Board on the committee of management shall be given every facility for examining the accounts of the society as well as the reports, diaries, and expenses sheets of the organisers, and the accounts shall be audited by a professional auditor to be approved by the Board.

The *Canada Gazette* for 30th May last contains an Order in Council, dated 21st May, 1908, which prescribes, with effect from 1st July, 1908, certain amended

**Importation of
Live Stock Into
Canada.** regulations respecting the free entry of horses, cattle, sheep, goats, asses, swine and dogs for the improvement of stock into the Dominion of Canada.

These regulations, which revoke those of 8th November, 1887, provide that no animal imported for the improvement of stock shall be admitted free of duty unless the importer is domiciled in Canada or is a British subject and furnishes a certificate of the record and pedigree in a list of registers designated from time to time by the Minister of Customs, showing that the animal is pure bred and has been admitted to full registry in a book of record established for that breed. An affidavit by the owner, agent or importer that such animal is the identical animal described in the said certificate of record must be presented.

In case such certificate is not at hand at the time of the arrival of the animals, the entry for duty may be accepted subject to the refund of the duty upon production of the requisite certificates and proofs in due form satisfactory to the Collector of Customs within *one year* from the time of entry.

The Lancashire Education Committee has recently appointed an expert for the purpose of testing and weighing milk, the

**Milk Tests in
Lancashire.** object being to demonstrate a method whereby farmers can eliminate from dairy herds those animals which produce milk of an inferior quality, and also those which produce it in insufficient quantity.

Each herd will be tested once a fortnight or once in three weeks, as this has been found to be sufficiently correct for all practical purposes, and is much less expensive than daily testing.* Those farmers taking advantage of the scheme will be in a position at the end of the year to know :—(1) The total number of gallons yielded by each cow. (2) The average percentage of fat in the milk of each cow. (3) The average percentage of solids not fat, in the milk of each cow.

Farmers desiring to have their herds tested, must arrange to provide board and lodgings for the expert while he is testing, and must also arrange to convey him and his apparatus to the next farm as required once each fortnight or once in three weeks.

The most suitable district would be one where breeding is carried out on the farms, as the information obtained by testing and weighing the milk would be of great assistance when determining which cows should be retained. It is of great importance in breeding to select bulls from cows giving heavy yields of milk of high quality, and this can only be done where the milk is systematically weighed and tested.

The scheme would also be of great value in a district where the farmer maintains his herd by purchasing heifers and keeping them on until about the time of the third or fourth calf. By selection based on the tests it would be possible to have all the older cows of the most valuable type, and if these were sold to the town or other dairymen, they would, undoubtedly, fetch high prices.

The milk tests might also be carried out in districts where farmers maintain their herds both by breeding and purchasing. During the present season over 325 cows are being tested.

This system is analogous to that adopted with so much success in Denmark, Sweden, Germany and elsewhere on the Continent, which was described in this *Journal*, April, 1905, Vol. xii, p. 21. The milk record associations formed by the Highland and Agricultural Society of Scotland for the same purpose were dealt with in an article in the *Journal*, September, 1907, Vol. xiv., p. 321.

* See *Journal*, May, 1907, Vol. xiv, p. 91, and March, 1908, Vol. xiv, p. 740.¹

A temporary break in the long spell of fine weather that characterised the latter part of July, occurred on the Wednesday and Thursday of the *first* week of August.

Notes on Weather and Crops in August. Slight rain fell in many parts of the country, and a considerable quantity at some of the South-Eastern stations. At other times, and except in the extreme northern and north-western districts, the weather remained fair and dry. Rainfall was, however, "light" or "very light" everywhere (in England S.W. "nought") and sunshine "abundant," except in England N.E. and E., where it was "moderate." During the *second* week the weather was fair or fine over the greater part of the kingdom, but rain was rather frequent, though not heavy in the extreme north and north-west, nor in the east and north-east. The warmth in the Eastern Section was, in general, "deficient," in the Western, "moderate," while rainfall was "light" or "very light." Bright sunshine exceeded the average in most places, but was only about equal to it in the Midland Counties and England S.W. The rainfall for the season was by this time below the average everywhere, in some places as much as two inches. It was, of course, not so much behind if the whole year be taken into account. The weather remained fair or fine to about the middle of the *third* week, when it became unsettled, with frequent rain and local thunderstorms of considerable severity over the more southern district. Warmth was "deficient" in England N.E. and Scotland E., elsewhere "moderate." Sunshine was "scanty" throughout the Eastern Section except in England S.E., where, in common with the whole of the Western Section, it was "moderate." Rainfall varied a good deal, but in general it was about the average over most of England. On the 20th as much as 1·42 in. fell at Stonyhurst, 1·65 in. at Dublin, and 2·09 in. at Kingstown.

During the fourth week the general condition was very unsettled over the whole kingdom. Falls of steady rain or passing showers alternated with intervals of bright sunshine. Thunderstorms were experienced in almost all localities. The temperature differed little from the average, the warmth being returned as "moderate" in all districts. The rainfall, however, was much in excess of the average. Measurements of about an inch were very common in the south-eastern quarter of England on Sunday, the 23rd, and falls of an inch or more were experienced over a very large part of Great Britain on Wednesday the 26th. Notwithstanding this, bright sunshine was above the normal in all districts except the English Channel.

The following account is given by a correspondent in Berkshire, who also reports that no rain fell between 17th July and 20th August. "The closing week of August proved a stop to harvesting, about a fourth being yet in the fields. But the rain has proved a godsend to gardens and to roots and pasture, which have all been much refreshed. As regards harvest the bulk will be in very small compass. For instance, one grower says that whereas he had 21 wheat ricks last year he has only 8 this. Another remarks that instead of 30 ricks as last year he will only have 15 this, and so on. The berry appears fairly good, but the amount of straw and corn is, in my opinion, considerably under average. Oats are a particularly inferior crop. No doubt the weather of 25th April did all corn crops harm and rendered the soil chill and cold when it ought to have been warm. With some, hay is thought to be the saving grace of the farmer, but the present price for good hay—£2 per ton—does not seem to promise much benefit." Another report from the same county says "The weather from the 1st to the 4th of August was fine and warm, then a few slight showers fell and it was much cooler. There was a little frost on the 15th, but still there was very little rain and about half the corn was put together in good condition by the 20th. Then the weather became wet and there has been very little corn carried since. It rained all day on the 23rd, and about an inch fell. Very heavy thunderstorm and gale on the 28th and damage done to outstanding crops. Pastures and roots very much improved by the rain, apples and plums blown down in large quantities by the gale." A report from the S.E. district says:—"Harvesting was well started by the beginning of the month, and favourable weather allowed half of it to be got in by the middle of the month. Around Bexhill in Sussex about a

quarter of the corn is still in the field, being apparently considerably later than Kent. In Kent and Sussex the plum crop is good. Apples of most sorts a good crop, but recent heavy gales have made a large number of plums and apples fall and caused great loss to the grower."

The reports received from the Crop Estimators of the Board on the condition and prospects of the principal crops on 1st August indicate that the most marked feature of the previous month was a general absence of sufficient

August Report on

Crop Prospects.

The cereal crops appear to have slightly improved since mid-July ; although, except in the case of barley,

which is one point better, the improvement is not sufficiently great to alter the figures that represented their condition a month before. Wheat is still the best of the three, being about average for the time of year, and oats are the worst ; as in July, also, the promise in the north is considerably better than in the south. Harvesting is in full swing in most districts of England, and the general fine weather allows of good progress without undue expense. Straw is generally short, and the plant thin, but the ears are frequently reported to be full.

Potatoes have made a very satisfactory improvement, and at present look like being the best crop of the year ; disease is comparatively rare. Roots, on the other hand, show considerable deterioration ; mangolds, as might be expected, suffered much less, if at all, from the dry weather, whereas turnips and swedes are backward and require rain badly. Instead of an over-average crop, as indicated by the July conditions, the prospects for roots as a whole are now rather below the normal.

The yield of hay was above the average, and generally secured in good condition ; but the pastures and aftermath have been rather seriously affected by want of moisture, so that "grass" of all kinds cannot be said to be so satisfactory as in July.

Fruit prospects are very variable : plums appear to be moderately plentiful in many places, but only half a crop in others : the reports concerning them are somewhat more favourable than in July. Apples may prove to be nearly average.

Hops promise to be a good crop, and they seem to be unusually free from vermin.

Labour is generally sufficient, the demand perhaps not being so great as last year, the favourable weather allowing of the freer use of machinery, in distinct contrast to the conditions prevailing last summer.

Summarising the reports, and representing an average crop by 100, the appearance of the crops in mid-August gives prospect of yields which may be represented by the following percentages :—Wheat, 100 ; Barley, 98 ; Oats, 96 ; Potatoes, 105 ; Roots, 99 ; Grass and Hay, 102.

The World's Grain Crops.—The Hungarian Minister of Agriculture, on 31st August, estimated the wheat crop of the world this year at 388,340,000 qrs. compared with 391,200,000 qrs. in 1907. The other principal crops

Notes on Crop Prospects Abroad. are given as follows :—Rye, 181,670,000 qrs. against 196,990,000 qrs. ; barley, 189,076,000 qrs. against 177,444,000 qrs. ; oats, 422,787,000 qrs. against 387,494,000 qrs. ; and maize, 1,915,100,000 cwts. against 1,782,500,000 cwts. in 1908 and 1907 respectively.

According to *Dornbusch's List* (28th August), the total wheat crop of the world is estimated at 382,100,000 measured qrs. as against 386,250,000 qrs. last year. This is a lower total than in any year since 1901, when the estimate stood at 357,455,000 qrs.

Germany.—According to the report issued by the Imperial Statistical Bureau on the condition of the crops in the middle of August, the harvesting of the winter-sown

grains was already far advanced. Rye had been cut and, to a large extent, housed in safety, and a great part of the wheat had also been cut and carried. The threshing results so far were very variable ; early ripening, lodging, and occasionally sprouting, have impaired the yield, so that the expectations which were entertained may not everywhere be realized. In general, however, a favourable opinion of the yield is entertained. The spring-sown crops have also been harvested to a great extent, though latterly, in consequence of unfavourable weather, with great difficulty. A decidedly more favourable opinion is held as to the potato crop than at the date of the last report. The rains have encouraged the growth of the tubers, though in places an excess of moisture has caused disease. The occurrence of disease, either in the leaf or tuber, was up to the date of the report confined within narrow limits, and did not give rise to serious apprehensions. The arithmetical condition is given as follows :— Winter wheat, 2·4 ; spring wheat, 2·6 ; winter rye, 2·4 ; spring rye, 2·5 ; barley, 2·6 ; oats, 2·7 ; and potatoes, 2·5 (1 = very good, 2 = good, 3 = medium (average), 4 = small).

Fruit and Potato Crops in Berlin District.—H.M. Consul-General at Berlin (Mr. P. Schwabach), in a dispatch dated 17th August, has forwarded the following particulars of the fruit and potato crops within his Consular district :—

The good prospects of a large fruit crop in this district have been largely dissipated by the weather conditions prevailing during the last few weeks, heavy thunderstorms, accompanied by hail, having caused a considerable amount of damage. Apple-scab has also been rather prevalent, and has reduced the crop.

The province of Brandenburg, which, owing to its large urban population, and especially to the requirements of the city of Berlin, consumes not only its own produce, but is also dependent upon supplies from abroad, is having a good crop of apples, but pears are not so abundant. The yield of cherries and plums is satisfactory, and currants and gooseberries are being gathered in considerable quantities.

In Saxony, a province that in good years is able to export to the United Kingdom a considerable quantity of plums, cherries, pears, currants and early potatoes, the crop is small this year. The production of gooseberries, currants, apples, cherries, and plums must be regarded as only fair, while the crop of pears is worse, and in many places is entirely lost. It is therefore uncertain to what extent English fruit importers can reckon upon supplies from that Province this year. The Chamber of Agriculture for the Province has, however, declared itself willing to put English importers into touch with firms who may have fruit for export at their disposal, and to give information respecting the class of fruit available, the quantities, freight-rates, &c. Applications should be addressed to “Landwirtschaftskammer der Provinz Sachsen, Abteilung Obstnachweis, 7, Kaiserstrasse, Halle-am-Saale.”

The other parts of the Consular district of Berlin are of no great importance so far as the foreign fruit trade is concerned, the consumption being practically equal to the production.

In spite of the sufficient rainfall which has latterly occurred, potatoes were not able fully to recover from the effects of a long period of drought. Although the present state shows a decided improvement, the plants have come up very unevenly, and some sorts are inclined to develop diseases. According to present observations a fair crop is to be expected.

Hop Crop in Germany.—H.M. Consul at Munich (Mr. L. Buchmann) reports that according to an estimate published in the local press, the hop harvest in Bavaria this year will produce about 325,000 cwts., an increase of 54,000 cwts. over the yield of 1907. It is calculated that the total production of hops in the whole of Germany will amount to about 564,000 cwts., exceeding that of 1907 by 81,000 cwts.

France.—The Ministry of Agriculture published on the 15th August its report on the state of the crops on 1st July. As regards winter wheat, the condition is given as good in 39 departments, fairly good in 37, and passable in three. Twenty-one

departments report the condition of spring wheat as good, and 26 as fairly good. The *Journal d'Agriculture Pratique* (20th August) observes that according to the official figures, the position was less favourable on 1st July than on 15th May, the date of the previous report. It has since been much depreciated by the influence of several days of sudden heat which burnt up the wheat, and of numerous storms which have caused much havoc. The sheaves are light, and it is doubtful if the crop will reach the average.

Hop Crop in Poland.—H.M. Consul at Warsaw (Mr. C. Clive Bayley), in a despatch dated 22nd August last, states that the Annual Hop Fair will be held in Warsaw on the 1st October. The present condition of this year's hop crop appears to be satisfactory, for though the plants were trimmed rather later than usual owing to the cold weather, they appear to be strong and healthy and have not suffered from diseases or destructive parasites. It is too early to give a correct estimate of the production. The stocks on hand of last year's crop are all depleted, and there is a constant demand for all classes of hops which cannot at present be supplied.

Hungary.—The Hungarian Minister of Agriculture in his report on the condition of the crops in the middle of August, states that the threshing results, as regards wheat, are more favourable than was anticipated. The area and yield of the various crops are given as follows:—

	1908.		1907.	
	Area.	Yield.		Yield.
Wheat...	Acres. 8,535,052	Qrs. 18,117,000	Qrs. 15,059,000
Rye	2,739,348	5,526,000	4,910,000
Barley	2,696,388	6,737,462	7,567,000
Oats	2,645,241	7,250,000	8,150,000
Maize	5,927,326	Cwts. 75,907,000	Tons. 77,786,000
Potatoes	...	I,440,427	Tons. 3,556,000	Tons. 4,771,000

Early potatoes gave nearly everywhere a poor yield, but the later sorts have benefited by the rains.

Canada.—The crop bulletin for July issued by the Census and Statistics Office states that the heat and drought of July have lowered the condition of field crops all over Canada, but less in Ontario and Alberta than elsewhere, because the ripening season in those provinces has been earlier. Measured on the basis of 100 for a standard condition, being a full crop of good quality, wheat fell during the month from 84 to 76, oats from 90 to 81, barley from 83 to 80, and rye from 92 to 78. It was too early at the end of July to give estimates of production for the lower provinces and British Columbia, but from the reports of correspondents in Quebec, Ontario, Manitoba, Saskatchewan and Alberta, the aggregate yield in those provinces is estimated as follows:—Wheat, 130,263,000 bushels; oats, 269,254,000 bushels; and barley, 51,690,000 bushels. The yield of wheat promises to be materially larger than that of 1907.

United States.—The Crop Reporting Board of the United States Department of Agriculture, in its September Crop Report, gives the average condition of the crops on the 1st of September, or when harvested, as follows:—Spring wheat, 77·6; oats, 69·7; barley, 81·2; maize, 79·4. The averages at the same time last year were respectively 77·1, 65·5, 78·5 and 80·2.

Turkey.—The following report (dated 7th August) on harvest prospects in Adrianople Vilayet has been received from H.M. Consul at Adrianople (Major

L. L. R. Samson) :—The crops in this district may be divided under two headings, viz.: Winter and Spring sowings. The former include wheat—hard and soft—rye, barley, and a small quantity of oats and German wheat, whilst the latter comprise all other crops. The Autumn rains of 1907 were late in falling, and sowings were in consequence delayed, but a comparatively mild winter was favourable to germination. On the whole, weather conditions have been favourable to winter crops, but the excessive heat of the latter part of the month of May was, in some districts, detrimental to soft wheat and barley, the former of which has also been slightly affected by brown rust. Spring sowings took place under exceptionally favourable circumstances, but the dryness and heat prevailing in the early summer checked the growth of maize, which in many localities has yielded only two cobs to each stalk. A certain proportion of the sesame crop was also affected by these conditions.

In consequence of the bad harvest of 1907, winter sowings were some 40 to 45 per cent. below the average; on the other hand spring sowings were much larger than usual. It is therefore estimated that the total amount of the combined sowings is about equal to that of former years.

The yield of the winter crops has been exceptionally good, with the result that a good average year is anticipated.

The following is the estimated production of the various crops, calculated on such data as are at present available:—Wheat (hard and soft), 8,100,000 bushels; barley, 4,300,000 bushels; oats, 1,950,000 bushels; rye, 1,410,000 bushels; maize, 2,850,000 bushels; canary seed, 25,000,000 lbs.; sesame, 5,000,000 lbs. The quality of soft wheat is inferior, of hard wheat and barley, good.

Smyrna :—Mr. Consul-General Barnham has supplied a report on the crops in the Smyrna Province, dated 13th August, in which it is stated that the quality of barley is good in general. Up to the present some 250,000 sacks have arrived by rail from the interior. The total crop is estimated at from 900,000 to 1,000,000 sacks (of 220 lb. each). Favourable years have brought in as much as 1,700,000 sacks, whilst the minimum touched in bad years was 600,000 sacks. Barley is said to weigh light this year. Wheat is of excellent quality. Some 8,000 sacks have reached Smyrna by rail and 67,000 by sea. The harvest is poor, and is not expected to reach the 500,000 sacks (of 242 lb.), which the country requires for local consumption. The quality of oats and maize is good.

South Australia.—The official return gives the area of wheat reaped in 1907-8 as 1,723,489 acres with a total yield of 19,098,547 bushels. (*Journal of Agric. S. A.*, July, 1908.)

The Board of Agriculture and Fisheries have been furnished by the Board of Trade with the following report, based on about 210 returns from correspondents in various districts on the demand for agricultural labour in August:—

in England **agricultural labour in August:—**

during August.

Employment was generally regular but wet weather interrupted harvest work during the latter part of the month, and a number of day labourers lost some time in consequence. The supply of this class of labour was generally quite sufficient to meet the demand, and in a good many districts there was some surplus.

Northern Counties.—Employment was generally regular in *Northumberland*, *Cumberland*, *Westmorland*, and *Lancashire*, though rain somewhat interfered with work at the end of the month. Finishing the hay harvest at the beginning of the month caused a good demand for extra labour, which was, however, amply met by the supply. The supply of day labourers in *Yorkshire* was generally somewhat in excess of the demand, especially during the first part of the month. Before the corn harvest had begun, a number of these men, including many Irish migratory labourers, were unable to obtain regular work.

Midland Counties.—In *Cheshire*, *Derbyshire*, *Nottinghamshire* and *Leicestershire* some time was lost by day labourers at the end of August, when wet weather interrupted the corn harvest; the supply of this class of labour was generally equal to the demand. Potato lifting and the corn harvest caused a fairly good demand for extra labourers in *Staffordshire*, but in most districts the supply was more than sufficient. There was generally regular employment in *Shropshire* after the corn harvest had begun. In *Worcestershire* there was a fairly constant demand for labour on account of fruit picking and the corn harvest, but the supply was ample. A demand for carters and cowmen was reported from the Pershore union. The supply of labour for the corn harvest was more than sufficient for the demand in *Warwickshire*. Turnip hoeing and the corn harvest generally afforded full and regular employment in *Northamptonshire*. Day labourers were in excess of the demand in *Oxfordshire*, and rain at the end of the month caused some irregularity of employment for this class of labour. The supply of and demand for labour were generally about equal in *Buckinghamshire*, but rain caused some interruption to men at harvest work. Employment was reported as regular in *Hertfordshire* and *Bedfordshire*, with the supply of labour generally about equal to the demand; in the Buntingford Union, in *Hertfordshire*, however, some scarcity of extra labour was reported.

Eastern Counties.—Wet weather somewhat interrupted harvest work at the end of the month in *Huntingdonshire* and *Cambridgeshire*, where, otherwise, there was regularity of employment, the supply of and demand for labour being about equal. Similar reports come from *Lincolnshire*. Turnip hoeing at the beginning of the month, and afterwards the corn harvest, generally provided regular employment in *Norfolk*. There was also fairly regular employment in *Suffolk* and *Essex*, rain, however, causing some interruption to harvest work at the end of the month. In each of the three last-named counties there was an ample supply of extra labour.

Southern and South-Western Counties.—Correspondents in *Kent* report that the supply of day labourers was generally in excess of the demand, and that a number of men were unable to get regular work, particularly during the wet weather towards the end of the month. Hoeing and harvesting provided fairly regular employment in *Surrey*, where the supply of and demand for labour were about equal. Rain interrupted the employment of day labourers in *Sussex* during the last week of the month. In this county and in *Hampshire*, where some interruption of work from rain was also reported, the supply of labour was generally about equal to the demand. Similar reports come from *Berkshire* and *Wiltshire*. Correspondents in *Dorsetshire* state that the backward condition of the root crops somewhat affected the demand for day labourers, but this improved when the corn harvest began; there was, however, an ample supply of such labour. Employment was fairly regular in *Somerset*, with a sufficient supply of labour. Wet weather caused some interruption to the employment of day labourers in *Herefordshire*, and there was not much demand for extra labour. Employment was generally regular in *Gloucestershire*, but there was some excess of day labourers, and rain interrupted the employment of this class of labour at the end of the month. Hoeing and the corn harvest generally provided full employment in *Devonshire* and *Cornwall*.

Bee Pest Prevention (Ireland) Act, 1908.—This Act, which applies only to Ireland, requires bee-keepers to notify the existence of bee pest or foul brood to the local authority. The Department of Agriculture, or the

Miscellaneous Notes.

local authority, may cause the destruction of infected bees or appliances, and compensation may be paid according to a scale prescribed by the department not exceeding one-half the value. The department may declare any area infected and make regulations for the carrying out of the Act.

Laws as to Injurious Insects and Foul Brood in the United States.—The Board have received, through the Foreign Office, a copy of Bulletin No. 61, published by the Bureau of Entomology of the United States Department of Agriculture, which

contains the laws in force in the various states and territories of the United States against injurious insects and fungi in living plants, and also as regards foul brood in bees. There is no Federal legislation providing for quarantine against plant diseases carried by imported plants although the subject has been discussed in Congress. An Act of Congress of 3rd March, 1901, prohibits the inter-state transportation of insect pests except for scientific purposes.

Potato Disease in Germany.—The supplement to the *Zeitschrift für Pflanzenkrankheiten* (Part 3, 1908), contains a long article, by Dr. Paul Sorauer, on the disease of potatoes in Germany which was referred to in this *Journal*, June, 1908, p. 205. Dr. Sorauer is of opinion that the discolouration of the tuber is not due to any definite fungus, but is a phenomenon of a non-parasitic kind, which may be seen in any year, but which occurred, to a specially severe extent, in last year's crop. Dr. Sorauer believes this to be dependent on a disturbance of the enzyme, which brings about changes resembling those which take place in germination, and that it is a phenomenon of a transitory nature which, given favourable weather conditions in the present year, will subside, as it has done on previous occasions.

Vine Mildew in South Africa.—This disease (*Plasmopara Viticola*) was first discovered in Cape Colony, in January, 1907, and was, in the absence of fuller information, regarded as new to the Colony. The district of Albany was at once declared an infected area, and the removal therefrom of *Vitaceæ* was prohibited. Subsequently the disease was found in other areas, and the destruction of all *Vitaceæ* was ordered, and the removal of other vegetable products was prohibited. It was ultimately proved, however, that the disease was most widely spread, and it was recognised that the attempted destruction of vines must be abandoned, because it was evident, on the one hand, that if the disease had in fact spread over an area of 25,000 square miles in a period of less than four months no human power could arrest its invasion of every part of South Africa; while, on the other hand, if the disease had existed in the affected districts for some time, but had, when discovered, just met with favourable climatic conditions for its development, the probability was that it already existed in practically every vine-growing district of the Colony, but that the dry summers of the south-western vine-growing districts were inimical to its growth. As the result of consultation with a number of experts, regulations have been made, dated 30th March, 1908, providing: (1) that plants of the family *Vitaceæ* shall not be introduced into certain districts from other parts of South Africa; (2) for the declaration of infected areas; (3) that no vegetable product shall be exported from infected areas to the non-infected areas, unless spraying and other preventive measures have been taken on the farm from which the product is sent, except products sent from farms on which no vines exist.

Regulations as to Importation of Plants into South Australia.—A Proclamation, dated 9th October, 1907, prohibits, absolutely, the introduction into South Australia of any grape vine or portion thereof. Other trees, plants, &c., may be introduced through Port Adelaide, if thoroughly cleansed from soil, after inspection and examination. The regulations may be inspected at the offices of the Board.

Hops on the Pacific Coast.—Mr. Consul Laidlaw (*Foreign Office Report, No. 4057, Annual Series*) states that the trade in hops was very unsatisfactory throughout 1907. The stocks carried over into 1907 by growers in Oregon and Washington were stated to be 41,000 bales of 185 lb., or 67,720 cwts. During January and February several thousand bales were sold at from 4½d. to 6½d., and during these months and March some contracts for 1907 hops were made at 6d. The market became more lifeless as the season advanced, with prospects of a large yield and heavy stocks of old hops. In July it was considered that the Oregon crop of 1906 had been much understated, and sales were made at from 2d. to 3½d., according to quality. When picking commenced in September, 4d. to 4½d. was obtainable for choice 'new crop'. At the close of the year prime hops were selling at 2½d. and old stock at as low as 1½d. A proportion of the crop was left unpicked, yet it is admitted that the crop of Oregon

was at least 140,000 bales, or 287,500 cwts., and that of Washington 32,000 bales, or 52,837 cwts. The crops in 1906 were 160,000 bales in Oregon and 55,000 bales in Washington. Unsold stocks at the close of the year are stated to be about 47,000 bales in Oregon and 8,000 bales in Washington. Attempts were made to form a growers' union of the Pacific coast, which aimed to control the entire crop, but these efforts have failed. Mr. Laidlaw considers that the figures of production given above are not at all overstated, and there is no certainty that the acreage under hops will be reduced to an appreciable extent, so that the prospects of the trade are far from being bright. It is difficult to trace what proportion of the hops leaving the district go to the British market, but from 1st September to 31st December 74,495 bales of Oregon hops were sent by rail to the eastern seaboard, and from that time to March, 49,870 bales have been forwarded.

Margarine Industry in Sweden.—The Canadian Commercial Agent for Sweden reports that the margarine industry of that country is steadily developing, the production now exceeding the home consumption. Consequently the Swedish margarine factories have been obliged to seek a market in foreign countries. The export of this product from Sweden, which five years ago amounted to 184,000 lb., rose in 1906 to nearly 1,400,000 lb., and in 1907 to about 2,500,000 lb. (*Board of Trade Journal*, 23rd July, 1908).

Production of Artificial Fertilisers in Italy.—The June issue of the *Bulletin Mensuel* of the French Chamber of Commerce at Milan contains an article on the production of chemical manures in Italy, from which the following particulars are extracted :—

The chemical fertilisers prepared in Italy consist chiefly of superphosphates, the great majority being mineral phosphates, and the remainder bone phosphates. Another artificial manure produced to a certain extent is sulphate of ammonia. The production of superphosphates has rapidly increased during recent years. In 1904 it amounted to about 8 million cwts., in 1906 to 12 million, and in 1907 to 16 million cwts. of mineral and 1 million cwts. of bone superphosphates. It is stated that the output is now almost equal to the demand, a small quantity only being imported. Sulphate of ammonia is produced by the large gas-works, the output amounting to some 200,000 cwts. annually. (*Board of Trade Journal*, 23rd July 1908.)

SUMMARY OF AGRICULTURAL EXPERIMENTS.

A large number of experiments and inquiries are now annually carried on by agricultural colleges and other bodies in various parts of the country, and the Board think it will be useful to give from month to month a short review or summary of the reports on these experiments, classified as far as possible according to the subject. It will not be possible within the limits of the space which can be allotted to the subject in this *Journal* to do more, as a rule, than give a brief indication of the character of the experiment and of the conclusions reached. Those who are interested in any particular investigation can refer for further details to the original publication.

The Board would be glad to receive for inclusion in this summary copies of reports on inquiries, whether carried out by agricultural colleges, societies or private persons.

EXPERIMENTS WITH CEREALS.

Varieties of Wheat (Field Expts. at Harper-Adams Coll., 1907).—Trials have been made at this centre with seven English wheats and six foreign varieties. Browick Grey Chaff gave the best result, but there was no great difference in value between this variety and Squareheads Master, Golden Drop and Red Stand Up. The foreign varieties gave very much lower yields though they fetched 1s. 6d. to 7s. 6d. per quarter more; and there was a difference of £4 per acre between the best English and foreign varieties.

Varieties of Wheat (Essex Education Committee, Field Expts., 1906).—Six varieties of wheat were tested on six farms in different districts. The average yields in bushels of 63 lb. were as follows:—Essex Rough Chaff, 40·2; White Chaff Browick, 46·8; Squareheads Master, 43·6; Squarehead, 44·9; Rivett, 47·2; Wilhelmina, 49·7. Red Fife was also grown on five farms, with an average yield of 29 bushels. Wilhelmina is a Dutch wheat with a good reputation in Holland.

Varieties of Wheat (Beds. C. C. Rept. on Wheat Plots, 1907).—Eleven varieties were tested on plots 35 poles in size. The season was not considered favourable and the quality of the samples was not very satisfactory. The best yields in bushels of 63 lb. were as follows:—Red Standard (Webb), 51; Imperial (Street), 49; White Stand Up (Carter), 46½; Squareheads Master, 43; Kinver Red, 42½. Red Fife yielded 39 bushels and was reported to be a splendid sample.

Varieties of Wheat (Cambridge Univ. Dept. of Agric. Guide to Expts., 1907).—This experiment gives the result of thick and thin sowing, the number and proportion of plants obtained and the results of calculating the yield from plots of half-an-acre and plots of $\frac{1}{40}$ th of an acre. As a rule thin seeding suited red wheats best, while thick seeding was best for white wheats. The results obtained by calculating the yield from the $\frac{1}{40}$ th acre plots were far from satisfactory, although the small plots were carefully chosen to represent the whole area.

Continuous Growing of Wheat and Barley (Journal of Roy. Agric. Soc., 1907).—The plan of the Woburn Field Experiments on the continuous growth of wheat and barley, which was originally designed in 1876–77, was altered in 1907 in several respects. Since these experiments began a good deal more knowledge has been collected as to the action of different manures and constituents of manures, and the conclusion of the thirtieth year of continuous cropping afforded a suitable opportunity of reviewing the original plan in the light of the experience gained. The fact of the manurial applications being, in many instances, out of proportion to what the farmer could profitably employ—under altered conditions of corn-growing—also militated against the ready acceptance of the experiments by the “practical” farmer, and placed them, as it were, beyond his reach. It was felt, therefore, that it would be desirable if the plan could be revised in some respects, without destroying its scientific value, so as to commend it more fully to the practical man. Certain modifications have consequently been introduced which are described in this report, which also contains the figures for 1907.

Varieties of Barley (Univ. Coll. of Wales, Aberystwyth, Agric. Dept. Ann. Rept., 1906).—Seven varieties, including some of the best-known sorts, were tried on a farm near Aberystwyth, but the best result was obtained by a Welsh barley from Pembrokeshire. As barley is grown in Wales solely for feeding purposes, a heavy yield is of more importance than quality, and

the native variety yielded 48 bushels compared with 32-44 bushels obtained from various malting barleys.

Varieties of Barley (Field Expts. at Harper-Adams Coll., 1907).—Nine varieties were grown at this college in 1907, and the yields per acre in bushels (56 lb.) were as follows :—Archers, 49 ; Goldthorpe, 43½ ; New Binder, 43 ; Binder, 39 ; Standwell, 38½ ; Champion Chevalier, 38½ ; Thousandfold, 37 ; Prolific, 35 : and Ideal, 31. A report is given of their malting qualities.

Varieties of Barley (Beds. C. C., Rept. on Demonstration Plots, 1907).—These experiments were made on light sandy ground and the results confirm those of previous years, Goldthorpe (Carter) and Kinver Chevalier (Webb) again taking the first two places as regards yield and quality. Either, it is stated, will answer well on light, sandy land.

Varieties of Barley (Univ. of Leeds, Bull. 71, 1908).—Tests with varieties of barley have been conducted at Garforth since 1901, and Brewer's Favourite, Goldthorpe, Standwell and Chevalier have been grown over the whole period. There was little difference between the average yields of saleable corn from these varieties, and the choice among them would depend to a great extent upon the previous crop. As regards quality Standwell took the first place on three occasions, Chevalier on two occasions, and Goldthorpe on one occasion. Brewer's Favourite has not been altogether satisfactory, but it took the second place in 1906 and 1907.

Cereal Breeding Experiments (Cambridge Univ. Dept., of Agric., Guide to Expts., 1907).—Experiments are in progress with wheat and barley with the object of building up new types in which the yielding power and quality will be better than that of the varieties in cultivation.

The varieties selected during the preliminary trials have been crossed with the idea of combining together their good features and eliminating those which from a farmer's point of view are objectionable. These crosses have given a number of new varieties, the most promising of which are now thoroughly fixed. Milling and baking trials have been carried out, the results of which show that the "strength" of these new varieties is far superior to that of any English wheat at present in cultivation. In fact the grain should bring much the same prices as the best imported Canadian varieties. Stocks of some of these varieties are now being grown to test their cropping capacity. An attempt is also being made to breed wheats which shall be resistant to yellow-rust. Experiments with barleys are proceeding on the same lines and a few new varieties have been obtained which appear to be of satisfactory quality.

Varieties of Oats (Univ. of Leeds, Bull. 71, 1908).—Tests of varieties of oats have been conducted at Garforth, near Leeds, since 1900. Each season the varieties that gave the biggest crops in the previous year were again tested, and along with them any new varieties placed on the market, whilst those that did not crop satisfactorily were discarded. Of the 11 varieties tested in 1900 only three appear in the list for 1907. It appears that Storm King, Tartar King, Waverley, and Abundance are the best cropping white oats, and Excelsior the best cropping black oat. Among those more recently introduced, with good results, are Beseler's Prolific, Thousand Dollar, Scottish Chieftain, Universal, and Wide Awake. The varieties were also compared as regards percentage of husk, and it was found that thin-skinned varieties, like Waverley and Abundance, though yielding a smaller number of bushels per acre than thick-skinned varieties like Storm King and Tartar King, produced as much, if not a greater, weight of food-stuff.

Varieties of Oats (Field Expts. at Harper-Adams Agric. Coll., 1907).--Trials have been carried out at this College since 1903, and eight varieties were tested in 1907. The yields per acre were as follows in bushels of 39 lb. :—New White Horse, 95 ; Thousand Dollar, 89 ; Banner, 85 ; Highlander, 84 ; New Abundance, 82 ; Giant King, 79 ; Beseler's Prolific, 73 ; and Universal, 70.

At the Newport Grain Show two varieties were shown from these plots, and New Abundance gained the 1st prize and Highlander the 2nd prize. A chart is given in the Report showing the yields of the different varieties tested since 1903.

Varieties of Oats (Univ. Coll. of Wales, Aberystwyth, Agric. Dept., Ann. Rept., 1906).--Tests with varieties of oats have been in progress for six years, and the following conclusions have been arrived at :—(1) That a change of seed, provided the proper variety be selected, is most desirable and profitable; such changes must be made at intervals of two or three years as the variety deteriorates; (2) that certain varieties are reliable and heavy croppers, whatever the character of the season may be, e.g., Waverley, Abundance, Newmarket, and Golden; (3) that many varieties, although costly, are so unsuitable to the soil and climatic conditions of Wales as to be very unprofitable; and (4) that trials on a small scale on every farm with a few varieties are to be strongly recommended.

Varieties of Oats (Univ. Coll., Reading. Results of Expts. at College Farm).--Trials of four varieties were made, viz., Thousand Dollar, Banner, Siberian, and Wide Awake.

Varieties of Oats (West of Scotland Agric. Coll., Bull. 41).--These experiments were carried out on 147 farms in eleven counties in Scotland during the five years 1902-1906. The conclusions arrived at were that the yield of all varieties of oats varies greatly according to the character of the season, but the variation is less in the West of Scotland in the case of acclimatized straw-producing varieties like the Sandy, than in the case of new and imported grain-producing varieties like the Banner. Seasons of low temperature, especially cold, wet springs, are very prejudicial to the oat crop. On suitable soils and in suitable districts, the grain-producing varieties like the Banner give in the average of years, larger and more profitable crops than the older Scotch varieties of either the Potato or the Sandy type.

Oats of the Banner type are more liable to be damaged by grub than the other kinds, and are best grown either as a second corn crop or after a root crop, and should only be grown after lea on friable and open soils, or on land in high condition or liberally manured. They are not adapted to cold, wet clays or mosses, or poor, exposed, unproductive land, or tough old lea land, but are best grown on good soils, and in not too exposed situations. On the former class of soils better results will be got from the Sandy type.

Varieties of Oats (Univ. Coll. of N. Wales, Bangor, Bull. 3, 1906, 5, 1907).--Fourteen varieties were tried at the College Farm in 1906 and 21 varieties in 1907. The heaviest yields of head corn, 42 lb. to the bushel, in 1906 were obtained from Thousand Dollar (57 bush.), Newmarket (54 bush.), Storm King (54 bush.), Waverley (53 bush.), Tartar King (51 bush.), and Wide Awake (51 bush.), and in 1907 from Newmarket (106 bush.), Wide Awake (104 bush.), Stable King (101 bush.), and Strube's Schlandstedter (101 bush.). The yields in 1907 were in many cases far in excess of previous years.

Varieties of Oats (Cambridge Univ., Dept. of Agric., Guide to Expts., 1907).—A number of varieties were tested between 1902 and 1905. The average yields of three varieties which were tried each year were as follows:—Thousand Dollar (71 bushels), Banner (70 bushels), and Siberian (70 bushels) of 39 lb. Canadian seed was used in each case.

Varieties of Oats (Beds. C.C., Rept. on Demonstration Plots, 1907).—Seven varieties were tested and Waverley, White Horse and Abundance gave the best results. The percentage of husk is given. The experiments confirm those of the two previous years in showing that oats of the Abundance type are most suitable to this district.

Manuring of Oats after "Seeds" (Lancs. C.C., Agric. Dept., Bull. 7).—The luxuriant growth of "Seeds" which is obtained in the majority of seasons in Lancashire, materially assists in ensuring a good oat crop in the following year, for when the residues of the "Seeds" are ploughed under, a large amount of food material becomes gradually set free from the roots, stems and leaves, as they decay in the soil. Many practical men therefore argue that the land after "Seeds" ought to be in sufficiently "good heart" to carry a heavy crop of oats without the need of any additional assistance.

These experiments were conducted on three farms in 1906 and five farms in 1907 to ascertain the effect of applying artificial manures and the results showed that fertilisers can be economically employed to manure an oat crop which follows "Seeds" in rotation. It is not necessary to use a "complete" mixture in order to produce a good crop, but the heaviest and most economical crop was obtained by employing a "complete" dressing, viz., one supplying nitrogen, phosphates and potash. An "incomplete" mixture, when nitrogen is the constituent left out, has comparatively little effect upon the growth and yield of the oat crop. It is not, therefore, good practice to apply a mixed dressing of potassic and phosphatic manures, unless it is intended to supplement this mixture later with a top dressing of a nitrogenous manure.

The following dressings per statute acre are recommended:—1. Nitrate of soda (half as top dressing), 130 lb., superphosphate, 2 cwts., kainit, 2 cwts., costing about 23s. 6d. 2. Sulphate of ammonia, 100 lb., superphosphate, 2 cwts., kainit, 2 cwts., costing about 22s.

The value of the increase produced by these two mixtures over the unmanured plots was on the average 39s. 10d. and 37s. 10d. per acre respectively, after deducting the cost of the manures.

Manuring of Oats (Univ. Coll. of Wales, Aberystwyth, Dept. of Agric., Ann. Rept., 1906).—The general practice in Wales is to grow the first oat crop following lea, without the application of any artificial manures, except perhaps, a few hundredweights of superphosphates sown at the same time as the seed, or basic slag applied a week or two earlier, but on soils in such a poor state of fertility as is generally found in the Principality, it is doubtful if the plan is not capable of improvement, and this experiment demonstrates that a complete dressing of artificials yields profitable results. Phosphoric acid seems to be the plant food most required, and an addition to the complete dressing of 20 per cent. of phosphoric acid is considered desirable. The complete dressing used in this experiment was made up of 1½ cwts. nitrate of soda, 1½ cwts. superphosphate and 2½ cwts. kainit.

Depth of Ploughing for Oats (Univ. Coll. of Wales, Aberystwyth, Dept. of Agric., Ann. Rept., 1906).—The depth of ploughing is important,

particularly on some soils, as in parts of Wales, where by going too deep poisonous compounds may be brought up which will not be sufficiently oxidised during the season and may prove detrimental to the crop. On the other hand, too shallow ploughing may restrict the feeding area available for the plant. In this experiment, the depth of the slice was increased by half-inches from 4 to 7 in., and it was found that by going deeper than 5 in. the yield of grain steadily diminished, while by ploughing shallower than 5 in. the yield became proportionately less.

Oats. Effect of change of Seed (Cambridge Univ., Dept. of Agric., Guide to Expts., 1907).—Home-grown seed was compared in 1906 with seed obtained from the Midlands, east of England, and north of Scotland. The seed from the Midlands did best, and that from Scotland worst; the latter was distinctly later than the others, both in starting growth and in ripening. The seed from different parts of the Eastern Counties gave much the same results.

Oats. Effect of change of Seed (Univ. Coll. of N. Wales, Bangor, Bull. 1, 1907).—In 1905 and 1907 seed was obtained from different districts of the British Isles and sown alongside home-grown seed. The experiment, so far, appears to show that little or no advantage is obtained by changing seed in cases where home-grown seed, well dressed and of good quality, can be obtained. The experiments do not support the view that, by obtaining seed from an early district, harvest may be hastened. All the plots ripened at practically the same time.

Oats. Quantity of Seed (Univ. Coll. of N. Wales, Bangor, Bull. 3, 1906).—The effect of sowing different quantities of oats was tested by using $3\frac{1}{4}$, $4\frac{1}{4}$ and $5\frac{1}{2}$ bushels per acre. The total yield was respectively 65, 67 and 70 bushels of 42 lb. Professor Winter observes that, as a rule, the quantity of seed should vary with the condition of the land and the time of sowing, a greater quantity being required where the land is in poor condition or when the season is late. More seed is necessary on poor land, as the corn does not tiller or "stool out" so well as on good land, and in a late season it is necessary to apply more in order to hasten the harvest, as when the land is thinly sown the tillering process may be carried on for too long a time, thus causing a late harvest. Wet districts usually require more seed than dry districts.

OFFICIAL CIRCULARS AND NOTICES.

The memorandum printed below on "How to obtain an Allotment or Small Holding," which will shortly be published as a leaflet, is intended to explain for the guidance of applicants the conditions under which land can be acquired from local authorities.

The object of this leaflet is to give those who desire to secure an allotment or a small holding from the Local Authority some information as to what they should do in order to obtain land, and as to the conditions under which land can be acquired. The leaflet has

How to Obtain an Allotment or a Small Holding.

nothing to do with small holdings or allotments provided by private landowners but is concerned only with those that can be provided by Local Authorities under the Small Holdings and Allotments Acts.

ALLOTMENTS.

Definition and Method of Application.—An allotment may be of any size up to 5 acres.

Applicants in rural parishes should write to the Clerk of the Parish Council, or to the Chairman of the Parish Meeting if there is no Parish Council, and applicants in urban districts should write to the Clerk of the Urban District Council or the Town Clerk as the case may be. They should state the amount of land required and whether arable or grass, and if any particular piece of land is desired it should be mentioned.

It does not follow that the Council will be able to obtain this particular land, but the information furnished will be of use to the Council by enabling them to meet the wishes of applicants as far as possible.

Where rules have been made by a Council as to the manner in which applications are to be made, the rules should be carefully observed.

Tenure.—Allotments cannot be sold to applicants but may only be let. No allotment may be sublet. Allotment tenants are entitled, on quitting their allotments, to compensation for unexhausted improvements under the Agricultural Holdings Acts, or under the Allotments and Cottage Gardens Compensation Act, 1887.

Powers and Duties of Local Authorities.—Allotment authorities can let land only to members of the labouring population resident in their parish, district, or borough. Women as well as men are eligible as tenants of allotments. The term "labouring population" may be taken to include all those persons whose main occupation involves manual labour and would embrace most persons to whom an allotment would be useful. But, if an applicant does not belong to the labouring population and requires land of more than 1 acre in extent, he can apply to the County Council for the land under the Small Holdings Acts. Allotment authorities can provide allotments up to 5 acres in size, but they are not obliged to provide allotments of more than 1 acre. If an applicant desires more than 1 acre and the allotment authority declines to take action, he should apply to the County Council for a small holding under the Small Holdings Acts.

If a Parish Council or Parish Meeting, or a District Council (not being a Borough Council) fail to carry out their obligation to satisfy the demand for allotments in their district, the County Council are empowered to provide allotments up to 1 acre at the expense of the defaulting authority, and the Council can deal with applications for over an acre under the Small Holdings Acts. If the County Council fail to act, the matter may be referred to the Board of Agriculture and Fisheries.

Acquisition of Land by Local Authorities.—A local authority can purchase or hire land for allotments either within or outside the parish, district, or borough, and can adapt such land for the purpose. They are also empowered to erect a dwelling house for occupation with any allotment of 1 acre and upwards. If a Borough or District Council cannot acquire land voluntarily, they can purchase or rent land compulsorily subject to certain restrictions, one of which is that no part of any holding of 50 acres or less can be compulsorily acquired. The purchase money or rent in such circumstances will be fixed by an independent arbitrator or valuer. In the case of a Parish Council or Parish Meeting being unable to obtain land for allotments by agreement with the landowners, the Council or meeting can represent the case to the County Council, who may thereupon proceed to acquire land compulsorily on behalf of the Parish Council or Parish Meeting.

Rent.—The rents to be charged to allotment holders will be fixed at sums sufficient to cover the expenses incurred in providing the allotment, such as the purchase money or rent paid by the local authority for the land, the cost of adaptation, &c., and the expenses of management. If a house is erected on the allotment additional rent will be charged to cover the cost. A Council is entitled to require the payment of one quarter's rent in advance.

SMALL HOLDINGS.

Definition and Method of Application.—A “small holding” for the purposes of the Small Holdings Acts, means an agricultural holding which is more than one acre and not more than fifty acres in extent. It may, however, exceed fifty acres provided the annual value for the purpose of income tax is not more than £50.

Applications for small holdings should be made to the Clerk of the County Council, or in the case of residents in a County Borough to the Town Clerk.

Persons Eligible as Applicants.—There is no restriction in the Small Holdings Acts as to the class or sex of persons that may apply for small holdings, except that they must “themselves cultivate the holding.” This expression is not to be understood in a narrow sense. The Acts define “cultivation” to mean the use of the land for any purpose of husbandry, including the keeping or breeding of live stock, poultry, or bees, or the growth of fruit, vegetables, and the like. Applicants will be expected to satisfy the Council that they have sufficient experience and means to work a small holding with the prospect of success. There is no provision in the Acts for the advance of money out of public funds to individuals taking up small holdings.

Acquisition of Land.—Councils can purchase or hire land for small holdings either in or outside the county or borough. If they are unable to obtain land by agreement, they can, with the sanction of the Board of Agriculture and Fisheries, acquire land compulsorily subject to the restrictions referred to in the case of allotments.

Councils have certain powers of adapting land for the purpose of small holdings, including the power to erect dwelling houses and other buildings.

Sale or Letting of Small Holdings.—Land that has been bought by a Council by agreement can either be sold or let to a small holder; but land taken on lease, or acquired compulsorily, can only be let.

Rent.—The rent to be paid by a small holder will be fixed by the Council at a sum not less than is sufficient to cover the rent or the interest on the purchase money paid by the Council, with the addition of a fair proportion of the cost of adapting the land for small holdings, and a sum to cover management and other expenses.

Terms of purchase.—The terms upon which a small holding may be purchased are as follows :—

At least one-fifth of the purchase money, including the cost of adaptation, must be paid down. One-fourth may be secured by a perpetual rentcharge, and the payment of the remainder of the purchase-money, together with interest, will be made in half-yearly instalments, which may be spread over a period not exceeding fifty years.

Every small holding sold by the County Council will, for twenty years, and thereafter until the whole of the purchase money is paid, remain subject to certain conditions drawn up to ensure that the holding shall not be diverted from the purposes of agriculture.

Assistance to existing Small Holders to buy their Holdings.—If the tenant of a small holding under a private landlord agrees with him for the purchase of the holding, the County Council may advance not more than four-fifths of the purchase-money. The money is repayable to the County Council upon the same terms as in the case of a small holding sold by the Council, and the holding will become subject to the same conditions.

Lettings to Associations.—Councils may, with the consent of the Board of Agriculture and Fisheries, let land for the purposes of small holdings or allotments to associations.

Persons desiring to form such an association, and to acquire land from a Council for the purpose of sub-letting it in small holdings or allotments to the members of the association or others, should communicate with the Secretary of the Agricultural Organisation Society, Dacre House, Dacre Street, Westminster, S.W., with a view to their adopting the necessary rules and becoming registered societies.

The second Order relating to American gooseberry mildew in Kent, dated 14th August, 1908, contains the following provision:—

**American Goose-
berry Mildew
(Kent) Order of 1908
(No. 2).**

according to the provisions in that behalf of the Destructive Insects and Pests Acts, 1877 and 1907."

"Notwithstanding the provisions of Article 6 of the American Gooseberry Mildew (Kent) Order of 1908 a notice under that Article may require the occupier of infected premises to destroy by burning or other effective method and by a date to be specified in the notice any bush or bushes on the premises, and the Local Authority shall pay compensation for such destruction subject and

In consequence of the discovery of American Gooseberry Mildew in Essex the Board of Agriculture and Fisheries have made an Order which came into operation on the 28th of August, 1908, and applied to the County of Essex. The Order follows the lines of the Orders applied to other counties where American Gooseberry Mildew has appeared, of which a summary was given in this *Journal*, January, 1908, p. 624.

REVIEW OF MARKET PRICES IN AUGUST.

. A. T. MATTHEWS.

First Week.—In the first week of August the trade had not only to reckon with Bank Holiday, which, falling on a Monday, entirely disorganises the business of the Metropolitan Cattle Market, but also with the fact that it is the commencement of the regular holiday season, when such a vast number of town and suburban residents transfer their custom to seaside towns and other pleasure resorts. This loss is immediately felt, and to a much greater extent than is generally realized by the general public or farmers and others who supply the London and other great markets. In the writer's opinion, it would be well if the habitual senders of stock to Islington Market could be made to understand how very generally all Bank Holidays are regarded as real holidays in London, in which feeling butchers form no exception, for, in short, they will not, as a body, attend the market on these occasions. Their absence on 3rd August was even more marked than usual, and less than half the 610 cattle and 4,840 sheep and lambs would have been quite sufficient to meet the requirements of the few buyers present. The consequence, of course, was that the stock could not be sold and this means a week's heavy expenses and also a certain amount of loss of bloom and condition. The salesmen and dealers, seeing the position of matters, did not attempt to force sales especially of fat cattle, and prices for them could not be quoted as lower. They were allowed to stand at $7\frac{1}{2}d.$ to $7\frac{1}{4}d.$ for Herefords and Devons and at $7\frac{1}{4}d.$ to $6\frac{1}{2}d.$ for Shorthorn bullocks, the small amount of actual business transacted rendering these figures more or less nominal.

It was most difficult to obtain a reliable quotation for sheep, the demand being so restricted, but such business as was transacted was certainly at a reduction of $\frac{1}{2}d.$ per lb. The best Down wethers of about 72 lb., dead weight, were quoted at $8\frac{1}{2}d.$, Cross-breds $8d.$, Scotch half-breds $9d.$, Cheviots $8\frac{3}{4}d.$, and Longwools $7d.$ per lb. At this time of year we look for the appearance at Islington of Hampshire Down "tegs," or forward lambs of

the current year, to meet the demand for small mutton. The first consignment of these grand young sheep arrived on Bank Holiday, and no better proof could be forthcoming of the truth of what has been said of the "off" character of that day than the fact that even these could not be sold. They were slaughtered at the abattoirs, sent to the Central Market, and sold there at $7\frac{1}{2}d.$ per lb. This was not a great price for such desirable quality, but it was $\frac{1}{2}d.$ per lb. better than any other English carcase mutton. The trade all over the country for beef during the week was slow and values were generally lower, although a few prime beasts still fetched $7d.$ per lb. This dullness was attributed in the Board's Weekly Market Returns to the falling off in quality of most of the cattle on offer as well as to the holidays. The highest quotation was at Newcastle, where the best Shorthorns made $8s. 6d.$ per 14 lb. stone, against $8s. 5d.$ at London, Ashford and Derby, and $8s. 3d.$ at Norwich.

The sheep trade was unchanged at the large majority of the country markets, but where there was any alteration in values the tendency was generally downwards. Norwich was rather a striking exception, for here there was a decided advance. At this place and also at Crewe the first quality of Downs realized $8\frac{3}{4}d.$ per lb., a price only exceeded at Shrewsbury, where $9d.$ was touched, while at Peterborough, Ipswich and York the highest price was only $7\frac{3}{4}d.$

The dead-meat markets were firm for beef all the week. Supplies of port-killed were small and prices relatively high. The London quotation was $6\frac{3}{4}d.$ for the best American and $5\frac{3}{4}d.$ for Canadian Ranch, against $6\frac{1}{2}d.$ for Scotch and $6\frac{1}{4}d.$ for English sides. Frozen beef showed a tendency to advance and chilled American was firm. London and Leeds were the two highest markets for English best beef, but cow beef in London was very low compared with the country markets. It is well known that many fat cows are bought regularly at Islington for the country trade. The trade for fresh mutton in London was remarkably slow and lifeless. Even the best Scotch was only worth $7\frac{1}{2}d.$ per lb. and English $7d.$ Dutch mutton is now competing severely with British at Smithfield and fetches only $\frac{1}{2}d.$ per lb. less than English. At Birmingham, Leeds, Manchester and Liverpool, English mutton ruled $4s. 8d.$ per cwt. higher than in London. Veal, which during July was very cheap, now became scarce and advanced $\frac{1}{2}d.$ per lb., the best realizing $7d.$ per lb.

Second Week.—The prevailing feature of the trade in fat cattle for the week ending 13th August was a dullness and slowness of demand, generally attributed to the poor condition of a large proportion of the animals on offer. At Islington on Monday there was a decided fall of $\frac{1}{2}d.$ per lb. all round excepting for a few choice Devons, and even these were $\frac{1}{2}d.$ lower, yet the market failed to clear. The top price of Shorthorns was $6\frac{3}{4}d.$ and of Herefords $7d.$ per lb. The trade for mutton was again lifeless, but prices were maintained, although all could not be sold. Down wethers at 72 to 80 lb., dressed weight, sold at $8\frac{1}{2}d.$ to $8d.$ per lb., but a few small Scotch cross-breds were worth $9d.$ and the Hampshire tegs, above described, nearly as much. The best lambs fetched no more than small mutton. At Ipswich next day there was a very good trade for both beef and mutton, but this market stood almost alone in that respect. A number of the official reports stated that trade was slow and that prices were unchanged, only two or three recorded any advance while several noted a decline. Peterborough, Ipswich and Norwich were the three best markets, $8s. 3d.$ per 14 lb. being their highest.

for best Shorthorns, while at London and several other markets the highest price was 7s. 10d.

The country trade for sheep was no better than in London. Only a few markets showed an advance, while the majority were slow at previous rates.

In consequence of short supplies, frozen and chilled beef were a little dearer at Smithfield, but the better classes were cheaper, Scotch sides declined $\frac{1}{2}d.$, English $\frac{1}{2}d.$, and port-killed $\frac{1}{2}d.$ per lb. Mutton was an exceptionally bad trade, the holiday demand being so small and good supplies of fresh Dutch being on offer. It is remarkable that English best mutton should only be worth 63s. per cwt. at London, while at Birmingham, Leeds, Manchester and Liverpool it was fetching 70s., but the causes above given are quite sufficient to account for the difference. Lamb was in very small demand in London, the extreme top price being 74s. 8d. against 77s. at Leeds, 70s. at Birmingham, Manchester and Liverpool, and 81s. 8d. at Dundee. Veal had become scarce in London and advanced $\frac{1}{2}d.$ per lb. On the Wednesday the largest dealer in Dutch at the Central Market had sold out at 11 a.m.—a very unusual occurrence.

Third Week.—As the month advanced the quality, or rather, the condition of the cattle coming to market steadily depreciated. The effects of the drought became very apparent, and really prime well finished cattle became scarce, while supplies of half-fattened cattle were proportionately large. Thus the trade was uneven, and in most markets neither a definite rise or fall could be reported. At a few, including Ipswich, Glasgow and Inverness an advance was established, but the general tendency was firmness for the few first-quality on offer, but a poor demand, and, in some cases a decline for the middling animals. The position of the trade was well exemplified by the exceptionally high prices made at Ipswich, where best Shorthorns made up to 8s. 9d. per (14 lb.) stone, or 7 $\frac{1}{2}$ d. per lb., and at Norwich, where the highest quotation was 8s. 6d. per stone, or 7 $\frac{1}{2}$ d. per lb. This was obviously owing to the superior grazing and feeding of that district, which produced far better condition, and attracted buyers from a distance. At corresponding markets in other parts of England during the week there was a striking difference, the highest price for Shorthorns in London being 7s. 10d., at Shrewsbury 7s. 7d., and at Bristol only 7s. 6d. Thus it will be seen that there was nearly 1d. per lb. between the prices realized in the extreme east and west.

The trade for sheep was depressed nearly all over the country and about 16 markets showed a fall in prices, improvement being only noted at Ipswich and Hull and, for extra good quality, at Newcastle. There is no doubt that the continued dry weather has at least greatly accentuated the depression in sheep as well as in cattle and more especially in lambs. Many have been evidently sent to market in order to thin down the stocks, and they may be badly wanted when the normal time arrives for their sale. There was a general revival in the demand for fat pigs, both bacon and pork, which sold readily in nearly every market, and at some places at a little more money.

The most interesting features in the dead-meat market were again the dearth of frozen and chilled beef, and the cheapness of British mutton in London. British beef remained unchanged and port-killed virtually so, but Argentine frozen hindquarters and American forequarters again advanced $\frac{1}{2}d.$ per lb.

The finest Scotch mutton was selling at 7d. per lb. against 8d. at last year's corresponding market, and the best English at 6½d. against 7½d., there being the same difference in the price of Dutch.

Veal declined ½d. per lb. on the week, but stood at 7d. for best English calves against 6½d. last year. There was no improvement in the trade for lamb, the best making only 7d. per lb. in London, and 7½d. at Leeds, Liverpool and Glasgow.

Fourth Week.—An aggravation of the drought causing so much unfinished stock to be forced on the market, trade became still more depressed at nearly all markets for both cattle and sheep. At no officially reported market was any general advance established. About half reported an actual decline in cattle, and the remainder retained late values with difficulty. The same may be said of sheep, and such uniformly unfavourable reports are very rare. In many places the large number of draft ewes in poor condition was a significant feature, plainly pointing to scarcity of keep on many farms. The heavy rains which have fallen during the week appear to have been fairly general, and great hopes are entertained that the pressure on the markets of low-conditioned stock will shortly be less severely felt, and a better trade will then result. London was one of the lowest markets for beef, sharing that position with Leicester and Leeds, the highest prices for Shorthorns at those places being 7s. 7d. per 14 lb., or 6½d. per lb. The highest prices for this class of beef were again made at Ipswich, namely, 8s. 3d., followed closely by Norwich and Chichester at 8s. 2d.

The dead-meat markets, especially that of London, presented some rather unusual features, frozen beef being sparingly offered and continuing to rise in price, while chilled beef was a bad trade. American declined ¼d. per lb. and closed at 6d. for best hindquarters. Scotch and English were practically unchanged, the latest top prices being—Scotch short sides, 7½d., long sides, 6½d., English, 6d. The business in port-killed was also in a peculiar condition. The best American was extremely scarce, and the bulk of the supply was composed of Canadian ranch beef. The few good Americans, which were hard to find, fetched 6½d., but the Canadians did not exceed 5½d. There was a falling off in the supply of carcase mutton and sales were more easily effected, but prices continue very low.

Store Stock.—The lower prices now being realised for mutton and wool could not fail to have a depreciating effect on store sheep and lambs, but this adverse influence has been greatly aggravated by the drought and poor prospects of winter keep. There is reason to suppose that the weak demand for store cattle has been almost entirely owing to the continued dry weather. The lamb sales in Scotland have varied considerably in relative values, but all record lower rates than last year. At some places the fall has been as much as 10s. per head, while in others it was only 2s. or 3s. per head. This difference may be partly accounted for by the comparative want of growth and condition in some districts. The sales in the south of England have been rather heavily supplied, and in the face of this fact and those already referred to it is satisfactory to find that in most cases all were sold at current values. The last sales and markets, which have been held since the rains, already show recovery of confidence and some hardening of prices.

THE WOOL SALES OF 1908.

The wool sales this year were looked forward to with a good deal of anxiety on the part of flock-owners. Country buyers, prior to any auction sales, took advantage of the reported great fall in the price of wool, and endeavoured to buy at a low figure, while flock-owners were induced to sell in many cases by the report that wool would go still lower. Those, however, who were in a position to hold their wool were subsequently repaid, as owing to the keen competition at the auctions and a certain demand from America, prices steadily improved, with the result that flock-owners who sold their clip by auction were quite satisfied, and in many instances realised as much as 1*d.* per lb. more than they had anticipated.

At the early sales, in which a large proportion of the wool was of the coarser kinds, the fall in price as compared with last year was from 4*d.* to 6*d.* per lb.; but at the later sales, in which fine quality Down wool formed the bulk of the supply, the fall was from 2*d.* to 3*d.* per lb.

The Hampshire and Wiltshire sales were a surprise to both buyers and sellers—the former expecting to be able to obtain what they wanted at fully 1*d.* to 1½*d.* per lb. less money than they actually had to pay. Several buyers expressed the opinion that these anticipations would have been fulfilled had they gone into the country and bought privately instead of waiting for the auctions. One of the chief causes of the exceptionally keen competition was the altering of several of the sale fixtures. Owing to the normal date of the Winchester sale having fallen during the pageant week, it was postponed, and several auctioneers in other places arranged to put off their sales for the convenience of the buyers. Blandford, however, did not fall in with this arrangement, but kept to the original date, and the Blandford sales, instead of being held on the day following those at Salisbury, took place the week before, thus leaving all the buyers free to attend small sales such as Hungerford, Newbury, Wallingford, and Didcot. Another important cause was the heavy buying of Irish manufacturers. The Bradford and Halifax buyers are wool merchants only, who buy the wool and sell it either graded or as "tops"; whereas the Irish buyers are cloth manufacturers, who manipulate the wool from its raw state to the finished article. They are therefore able to pay 4*d.* per lb. more for their wool, thus saving the middleman's profit:

The quality of the wool was fully up to the average, but the proportion of greasy over washed was greater than last year, and it is anticipated that unless the difference in price increases the practice of washing sheep will tend to diminish; nevertheless, at the later sales the demand for washed wools was certainly keener than for greasy, probably owing to the fact that the American demand is for washed wool only. Flock-owners, however, state that the expense of washing and the risk of injury, especially to fat sheep, are barely compensated by the small difference in price, namely, 2½*d.* to 3*d.* per lb., and with this several buyers agree. Still, buyers as a rule appear to be indifferent whether wool is washed or greasy, for whereas a few buyers deal in washed wool only, the majority buy both kinds, and owing to the fact that for some classes of trade washed wool is indispensable, it is hardly likely that the practice of washing sheep will entirely die out. The chief complaint is that farmers spoil their samples by careless packing, the worst offence being the habit, especially in Somerset and Dorset, of tying the fleeces with string: the consequence is that pieces of fibre get into the wool,

and as they are very difficult to remove, and will not take the dye, great damage is often done. Another bad practice is that of leaving lumps of earth on the fleeces ; this often leads to disputes with the auctioneer as to allowances.*

The highest price of the season was $12\frac{1}{2}d.$ for washed South Down wool, while Hampshire Down teg wool made as much as $11\frac{1}{2}d.$ washed and $8\frac{1}{4}d.$ unwashed, but the average price for best Down wool would be about $10\frac{1}{2}d.$ and $7\frac{1}{2}d.$ respectively. Coarser wool varied considerably.

Taking the sales as a whole they may be regarded as satisfactory. The amount offered for open sale, which was fully up to the average, and in some cases in excess of last year's supplies, would appear to show that only a comparatively small amount of buying was done privately prior to the sales. The fact that nearly all the lots were sold points to the conclusion that the season of 1908 has not been so disastrous as was anticipated at the beginning of the year. There is one peculiar fact worth mentioning with regard to the Bradford trade. It is estimated that although as much wool has been sold during the season as in former ones, less wool has gone to Bradford than last year, a very large amount having been bought for Ireland.

REVIEW OF PROVISION TRADE IN AUGUST.

HEDLEY STEVENS.

Bacon.—August is usually one of the best months of the year for the consumption of bacon, and the highest prices are secured for side meat. The reverse has happened this month, as directly the bank-holiday demand had been met there was an appreciable falling off, and prices began to decline. During the week ending 14th August official quotations for Danish sides were reduced 3s. to 8s. per cwt., and the following week further reductions of from 4s. to 5s., making in a period of about ten days, a fall of 12s. per cwt. on some selections. The arrivals of Danish into London were only about 4,400 bales in excess of the receipts for the same time last year. The slump in Danish also brought down the prices of English and Irish sides, although not to the same extent, but about 5s. to 6s. per cwt. In addition to the smaller demand, the severe fall in the prices of Danish was helped by the arrival of some imperfectly cured lots, the hot weather necessitating all mildly cured meats being handled quickly. These conditions materially assisted the sale of the best brands of Canadian bacon, more reliably cured, which sold at reductions of from 2s. to 4s. per cwt. only ; the secondary brands were neglected, and low prices had to be accepted to effect sales. During the last few days of the month the position improved, the lower prices attracting more business, and 1s. to 2s. advances were secured for Danish, prices also hardening for English and Canadian.

The arrivals of American bacon have been below the average, and at the commencement of the month slight advances were made for freshly arrived parcels, but by the end of the month these increases had been lost. Stocks in English Cold Stores are still large, and buyers have the advantage in price if in a position to deal in such goods.

* This subject is dealt with in Leaflet No. 82, "Preparation of Wool for Market," copies of which can be obtained, post free, from the offices of the Board. A pamphlet has also been issued by the Home Wool Buyers Association, which was reprinted in his *Journal*, July, 1907, Vol. xiv., p. 241.

Hams have experienced only a moderate demand for the time of year and prices for both home and foreign are below those of last year, having fallen several shillings per cwt. by the end of the month. Pigs were brought into the factories in small numbers only at the beginning of the month, breeders apparently looking for the customary increased August demand for bacon, when they are generally able to make good terms with the curers. Later in the month supplies were much larger, and lower prices had to be accepted.

Cheese.—The month opened with a much better consumptive demand, and slightly higher prices were paid. Later buyers expressed the feeling that prices were too high and could not be sustained, weather conditions for the making of cheese having improved both in Canada and England, on the month spot prices improved about 2s. per cwt. for Canadian cheddars, in sympathy with similar advances paid to Canadian shippers for August shipments. The last few days of the month saw a reduction in cabled prices of from 1s. to 1s. 6d. per cwt., which affected spot prices to a similar extent, causing buyers generally to postpone operations fearing further reductions, and at the close of the month transactions were limited all round. The total shipments from Canada since 1st May to 15th August have been 886,712 cheeses, against 1,046,124 for the same period in 1907, and 1,203,956 in 1906. The estimated stocks of Canadian cheese in England on 31st August are 14 to 15 per cent. less than last year.

English farmers are reported to be taking full advantage of the improved weather to increase their output of cheese, as there is every prospect of their being able to realise remunerative prices. At most of the recent shows and fairs the quantities on offer have been in excess of last year.

The latest advices from New Zealand report that the prospects are good for a large make of cheese. Factories which have hitherto confined their output to butter are being fitted up with cheese-making machinery, giving the factorymen the opportunity of manufacturing whichever is the most profitable. This will doubtless result in more cheese being made for export.

Butter.—No real improvement can be reported in the demand, buyers preferring to operate for immediate requirements only. Spot prices range from 10s. to 16s. above those current at the same time last year. Imports have been on a larger scale than during August 1907, and Cold Store stocks have considerably increased at all centres. Large quantities are reported to have been stored in America, with the view to a good demand from England in the fall of the year. Prospects are also favourable for a large make in New Zealand and Australia. Arrivals of Siberian continue to decrease, and Germany is reported to be buying more freely in order to have a stock for her winter trade. The bulk of English buyers are of the opinion that prices are too high for speculation, and refuse to contract to any extent for future deliveries at present prices. The total shipments from Canada from 1st May to 15th August, 63,860 packages, as compared with 44,001 in the corresponding period of 1907, and 216,409 in 1906.

Eggs.—The demand early in the month was disappointingly small, and sellers were easy to approach in regard to prices. By the middle of the month supplies were somewhat curtailed, and a determined effort was made to obtain better prices, which was partially successful. Prices of all selections are too high to admit of free trading.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND
in the Month of August, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—				
Cattle :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Polled Scots ...	8 2	7 11	39 6	35 11
Herefords ...	8 2	7 8	—	—
Shorthorns ...	7 11	7 3	38 4	35 2
Devons ...	8 4	7 7	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
Veal Calves ...	d. 7 1	d. 7	d. 8	d. 6 1
Sheep :—				
Downs ...	8 1	7 1	—	—
Longwools ...	7 1	6 1	—	—
Cheviots ...	8 1	7 1	8 1	7 1
Blackfaced ...	7 1	7 1	7 1	7
Cross-breds ...	8	7 1	8 1	7 1
Pigs :—	per stone.*	per stone.*	per stone.*	per stone.*
Bacon Pigs ...	s. d. 6 4	s. d. 5 9	s. d. 6 3	s. d. 5 6
Porkers ...	6 8	6 2	6 6	5 10
LEAN STOCK :—				
Milking Cows :—	per head.	per head.	per head.	per head.
Shorthorns—In Milk ...	£ s. 20 18	£ s. 17 13	£ s. 22 5	£ s. 17
—Calvers ..	20 15	17 16	20 6	17 2
Other Breeds—In Milk ..	21 5	13 19	20 2	16 6
—Calvers ...	14 2	12 0	20 0	15 19
Calves for Rearing ...	2 5	1 14	2 3	1 10
Store Cattle :—				
Shorthorns—Yearlings ...	9 10	8 8	9 15	7 19
" —Two-year-olds ...	13 12	12 4	14 8	11 19
" —Three-year-olds ...	16 11	14 16	16 15	13 10
Polled Scots—Two-year-olds	—	—	13 9	12 12
Herefords— "	15 2	13 10	—	—
Devons— "	14 0	11 15	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs, and Lambs—				
Downs or Longwools ...	33 4	28 10	—	—
Scotch Cross-breds ...	—	—	25 0	20 5
Store Pigs :—				
Under 4 months ...	21 7	16 1	19 10	14 11

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of August, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birming-ham.	Man-chester.	Liver-pool.	Glas-gow.	Edin-burgh.
BEEF :—		per cwt. s. d.					
English ...	1st	56 6	55 6	54 0	—	60 6*	58 0*
	2nd	54 0	51 6	50 0	—	57 6*	51 6*
Cow and Bull ...	1st	42 0	49 0	48 0	45 6	46 0	46 6
	2nd	35 6	44 6	42 0	39 0	41 6	40 6
U.S.A. and Cana-dian :—							
Port Killed ...	1st	59 0	55 0	55 0	56 0	55 6	55 0
	2nd	52 0	49 0	50 6	51 6	49 0	49 0
Argentine Frozen—							
Hind Quarters ...	1st	42 6	42 6	41 6	41 6	42 6	42 0
Fore „ „	1st	30 0	31 0	30 6	29 0	31 0	30 0
Argentine Chilled—							
Hind Quarters ...	1st	51 6	52 0	50 6	52 0	51 6	52 6
Fore „ „	1st	34 6	34 6	33 0	32 0	35 0	—
American Chilled—							
Hind Quarters ...	1st	63 0	65 6	64 0	64 0	60 6	66 6
Fore „ „	1st	41 6	43 0	42 0	42 0	39 6	44 6
VEAL :—							
British ...	1st	66 6	61 0	64 0	70 6	—	—
	2nd	62 6	53 6	56 0	65 6	—	—
Foreign ...	1st	65 6	—	—	—	—	67 6
MUTTON :—							
Scotch ...	1st	69 0	—	—	74 6	72 6	66 6
	2nd	64 6	—	—	70 0	62 0	56 6
English ...	1st	63 0	69 6	67 6	70 0	—	—
	2nd	59 0	56 6	60 6	65 6	—	—
U.S.A. and Cana-dian :—							
Port killed ...	1st	—	65 6	—	62 0	—	—
Argentine Frozen ...	1st	32 6	34 0	32 6	32 6	32 6	32 6
Australian „ „	1st	31 6	32 6	30 6	30 6	32 6	—
New Zealand „ „	1st	41 0	—	—	—	43 0	—
LAMB :—							
British ...	1st	71 0	69 6	68 0	70 6	73 6	69 6
	2nd	67 6	65 6	63 0	63 6	63 0	60 0
New Zealand ...	1st	53 6	54 0	52 0	52 0	56 0	58 6
Australian ...	1st	48 0	50 0	—	—	46 6	—
Argentine ...	1st	—	50 0	49 0	49 0	42 0	—
PORK :—							
British ...	1st	51 6	57 6	56 0	56 6	54 0	51 6
	2nd	46 6	52 6	50 0	52 0	51 6	43 0
Foreign ...	1st	53 6	55 6	54 0	54 0	—	—

* Scotch.

AVERAGE PRICES of British Corn per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1906, 1907 and 1908.

Weeks ended (in 1908).	Wheat.			Barley.			Oats.		
	1906.	1907.	1908.	1906.	1907.	1908.	1906.	1907.	1908.
Jan. 4	28 4	26 0	35 1	24 6	23 11	26 9	18 2	17 3	18 4
" 11	28 6	26 1	35 2	24 8	24 2	26 9	18 4	17 4	18 3
" 18	28 5	26 1	35 5	24 11	24 1	27 1	18 4	17 5	18 5
" 25	28 7	26 2	35 6	25 1	24 5	26 11	18 7	17 5	18 5
Feb. 1	28 10	26 3	35 0	25 1	24 4	26 11	18 10	17 5	18 4
" 8	28 10	26 6	34 3	25 3	24 5	26 9	18 10	17 7	18 3
" 15	28 11	26 7	33 1	25 6	24 1	26 9	19 0	17 7	18 0
" 22	28 10	26 10	32 6	25 4	24 2	26 5	19 0	17 9	17 11
" 29	28 8	26 9	30 11	25 0	24 2	26 3	19 0	17 9	17 8
Mar. 7	28 5	26 8	30 5	25 1	23 11	26 1	18 8	17 11	17 8
" 14	28 5	26 10	31 3	24 8	24 2	26 0	18 10	18 0	17 10
" 21	28 4	26 10	31 7	24 4	24 0	26 2	18 8	18 1	17 11
" 28	28 3	26 8	31 4	24 5	23 9	25 10	18 11	18 2	17 10
Apl. 4	28 7	26 9	31 3	24 2	24 3	25 5	18 11	18 3	17 9
" 11	28 11	26 8	31 2	24 4	23 9	25 10	19 4	18 6	17 7
" 18	29 4	26 8	30 11	24 0	23 3	26 1	19 1	18 7	17 7
" 25	29 6	26 10	30 10	24 0	23 3	25 5	19 6	18 9	17 9
May 2	29 10	27 0	31 6	23 10	23 6	25 8	19 9	19 3	18 0
" 9	30 1	27 6	32 4	24 1	24 0	25 5	20 0	19 7	18 4
" 16	30 3	28 4	33 1	23 10	23 10	24 9	20 1	20 1	18 7
" 23	30 4	29 7	33 8	24 2	24 3	25 9	20 2	20 5	18 10
" 30	30 4	31 4	33 5	22 10	24 0	24 6	20 5	20 8	18 8
June 6	30 3	32 0	33 1	23 4	24 7	25 10	19 11	20 7	18 4
" 13	30 4	31 10	32 7	23 6	24 7	24 5	20 2	20 11	18 4
" 20	30 5	31 4	32 0	22 10	24 11	24 2	20 2	20 9	18 5
" 27	30 3	31 2	31 5	24 3	24 6	24 0	20 1	20 8	18 7
July 4	30 2	31 3	30 11	23 0	24 8	23 11	20 2	20 11	18 7
" 11	30 5	32 0	30 5	23 8	24 10	24 4	20 4	20 11	18 5
" 18	30 3	32 6	30 7	23 2	24 6	23 1	20 5	21 1	18 5
" 25	30 5	32 11	31 5	22 4	27 3	26 5	20 2	20 8	18 6
Aug. 1	30 9	33 2	31 10	22 1	26 4	24 4	19 3	21 2	18 7
" 8	30 5	33 5	31 6	23 0	26 6	23 1	17 11	21 3	18 9
" 15	29 0	33 6	31 6	24 2	25 9	23 10	17 0	20 4	18 1
" 22	27 9	33 7	31 2	25 0	25 0	24 5	16 10	19 8	17 10
" 29	26 9	33 10	30 10	24 3	24 6	24 5	16 6	18 11	17 1
Sept. 5	26 4	31 11	30 10	24 9	24 2	25 5	16 3	17 7	13
" 12	25 11	31 4		24 3	24 4		16 1	17 6	
" 19	25 9	31 5		24 3	25 0		16 0	17 6	
" 26	25 9	31 8		24 8	25 3		16 2	17 8	
Oct. 3	26 1	32 6		25 0	25 5		16 3	17 9	
" 10	26 3	33 3		25 3	25 9		16 7	17 11	
" 17	26 6	34 4		24 10	26 3		16 8	18 0	
" 24	26 7	35 9		24 10	27 2		16 10	18 7	
" 31	26 7	36 3		24 8	27 7		16 11	18 10	
Nov. 7	26 6	35 10		24 8	27 8		17 1	18 10	
" 14	26 4	35 1		24 4	27 8		17 2	18 8	
" 21	26 3	34 7		24 1	27 5		17 3	18 9	
" 28	26 1	34 7		24 1	27 5		17 2	18 7	
Dec. 5	26 1	34 7		24 1	27 1		17 4	18 6	
" 12	26 1	34 8		23 11	27 0		17 3	18 5	
" 19	26 3	34 9		24 3	27 1		17 3	18 3	
" 26	26 0	34 6		24 1	26 10		17 3	18 0	

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates : Wheat, 60 lbs. ; Barley, 50 lbs. ; Oats, 39 lbs. per Imperial Bushel.

AVERAGE PRICES of Wheat, Barley, and Oats per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

	WHEAT.		BARLEY.		OATS.	
	1907.	1908.	1907.	1908.	1907.	1908.
France : July	44 0	37 2	26 3	25 4	22 9	19 8
Paris : August	42 7	37 9	25 9	25 4	21 2	19 9
France : July	46 6	38 6	27 9	26 2	22 6	19 3
Paris : August	43 9	38 4	26 11	26 2	21 7	19 3
Belgium : June	33 6	34 6	26 6	26 3	23 9	21 5
Germany : June	35 4	34 5	25 5	25 1	24 0	21 2
Germany : July	44 8	44 8	31 3	26 4	27 0	22 3
Berlin : May	45 4	44 9	30 7	26 9	27 5	22 8
Berlin : June	43 8	47 3	—	—	27 1	22 10
Berlin : June	44 0	45 5	—	—	27 3	22 7
Breslau : May	41 6	44 4	{ (brewing) 26 3 (other) 29 0	{ (brewing) 25 11 (other) 28 6	{ 25 2	20 9
Breslau : June	43 6	43 7	{ (brewing) 26 6 (other)	{ (brewing) 26 0 (other)	{ 25 3	20 6

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets. The mark is now taken as equal to 11·8d., and the German prices for the former year have been recalculated on this basis.

AVERAGE PRICES of British Wheat, Barley, and Oats at certain Markets during the Month of August, 1907 and 1908.

	WHEAT.		BARLEY.		OATS.	
	1907.	1908.	1907.	1908.	1907.	1908.
London...	33 1	32 1	26 11	24 5	20 5	18 8
Norwich	32 11	30 4	26 1	26 1	19 11	18 3
Peterborough	33 0	30 11	24 11	24 4	20 4	17 1
Lincoln...	34 1	32 2	—	24 4	20 8	18 7
Doncaster	33 8	32 3	—	—	21 11	19 1
Salisbury	32 4	31 0	23 3	26 7	19 9	17 9

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of August, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Bristol.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
BUTTER :—	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
British ...	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
... 13 6	12 3	13 6	12 6	—	—	—	15 0	—
Irish Creamery	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
" Factory	116 0	113 0	118 6	116 0	114 0	111 0	114 6	—
" Danish	106 0	100 0	109 6	103 6	105 6	100 0	—	—
Russian ...	123 0	121 0	—	—	122 0	118 6	121 0	—
Australian ...	110 6	106 6	112 0	108 0	109 6	106 6	108 0	104 0
New Zealand	116 0	114 0	—	108 0	—	—	—	—
CHEESE :—								
British—								
Cheddar ...	78 0	75 6	74 0	64 0	70 0	65 0	63 6	59 0
Cheshire ...	—	—	—	—	120 lb.	120 lb.	—	—
Canadian ...	60 6	59 0	60 0	58 6	60 0	59 0	60 0	58 6
BACON :—								
Irish ...	69 0	65 6	—	—	69 6	63 6	71 0	67 6
Canadian ...	57 6	55 6	60 6	57 0	58 0	55 6	60 0	58 0
HAMS :—								
Cumberland ...	101 6	90 6	—	—	—	—	—	—
Irish ...	100 0	91 0	—	—	—	—	102 0	93 0
American (long cut) ...	56 0	54 0	57 6	52 6	58 6	52 0	59 6	56 6
Eggs :—	per 120.	per 120.						
British ...	12 6	10 7	11 0	—	11 3	8 1	—	—
Irish ...	10 1	9 2	9 4	8 11	9 8	8 7	9 8	7 11
Danish ...	9 9	8 9	9 0	8 4	9 10	9 4	9 4	7 11
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Sir John Llewellyn	71 6	63 6	85 0	80 0	76 6	66 6	—	—
Royal Kidney	86 6	76 6	76 6	70 0	88 6	78 6	—	—
Snowdrop ...	73 6	65 0	80 0	70 0	90 0	80 0	—	—
HAY :—								
Clover ...	85 6	70 0	75 0	—	73 6	56 0	60 6	53 0
Meadow ...	73 6	58 0	67 6	—	—	—	47 6	42 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	AUGUST.		8 MONTHS ENDED AUGUST	
	1908.	1907.	1908.	1907.
Swine-Fever :—				
Outbreaks	126	264	1,471	1,823
Swine Slaughtered as diseased or exposed to infection ...	1,281	1,265	8,500	8,495
Anthrax :—				
Outbreaks	77	77	760	750
Animals attacked	95	105	1,015	992
Foot-and-Mouth Disease :—				
Outbreaks	—	—	3	—
Animals attacked	—	—	112	—
Glanders (including Farcy) :—				
Outbreaks	68	88	555	628
Animals attacked	236	162	1,758	1,440
Sheep-Scab :—				
Outbreaks	4	10	637	416

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	AUGUST.		8 MONTHS ENDED AUGUST.	
	1908.	1907.	1908.	1907.
Swine-Fever :—				
Outbreaks	8	25	132	109
Swine Slaughtered as diseased or exposed to infection ...	176	335	2,863	1,670
Anthrax :—				
Outbreaks	1	—	6	1
Animals attacked	1	—	9	3
Glanders (including Farcy) :—				
Outbreaks	—	1	—	4
Animals attacked	—	1	—	8
Sheep-Scab :—				
Outbreaks	4	5	276	190

 SELECTED CONTENTS OF PERIODICALS.

Journal of Economic Biology. 3. 2.

On an enchytraeid worm injurious to the seedlings of the larch, *C. Gordon Hewitt.*

Journal of the Land Agents' Society, August, 1908.

Woodland industries, III :—Charcoal burning, *T. Roberts.*

Proceedings of the Royal Society, B, Vol. 80, 1908.

Nitrification in acid soils, *A. D. Hall, N. H. J. Miller and C. T. Gingham.*

Journal of the Department of Agriculture, South Australia, April, 1908.

Egg-laying competition at Roseworthy, *D. F. Laurie.*

Journal of the Department of Agriculture, Western Australia, April, 1908.

Wheat selection, *E. A. Mann.*

Bulletin Mensuel de l'Office des Renseignements Agricoles, Juillet, 1908.

France : Aperçu sur l'état actuel et les tendances de l'industrie electrochimique du nitrate de chaux.

Annales de l'Institut National Agronomique, 2^e Série. VII. I.

Commerce de la pomme de terre de primeur de Jersey et de Bretagne, *N. Marmu.*

Annales de la Science Agronomique, 3^e Série, 1907. Tome II.

Les sols forestiers (Chapitres XI–XVIII), *E. Henry*; De l'alumine dans les plantes, *H. Pellet et Ch. Fribourg.*

Journal für Landwirtschaft. LVI. II.

Über die Unterscheidungsmerkmale der Distichumgruppe (Zweizeilige Gerste), *J. Broili* ; Düngungsversuche mit Stickstoffkalk für Kartoffeln, *A. Stutzer* ;

Über die Schwankungen der landwirtschaftlichen Roherträge, *E. A. Mitscherlich* ;

Die Flugbrandarten des Getreides, ihre Verbreitung und Bekämpfung, *R. Falck.*

 ADDITIONS TO THE LIBRARY.

[NOTE.—The receipt of *annual* publications of foreign agricultural and other departments, experiment stations and societies is not noted in the monthly list of additions to the Library, but a list of all such publications, which are regularly received, will be given from time to time.]

Great Britain—

Strathmore, Helen.—New Developments in Poultry-Raising. (52 pp.) Gomshall, Surrey : Highview Press, 1908. 1s. 6d. net.

Hiesemann, M.—How to Attract and Protect Wild Birds. Translated by Emma S. Buchheim. (86 pp.) London : Witherby, 1908. 1s. 6d. net.

Wright, Horace, J.—Peas. (20 pp.) London : Agricultural and Horticultural Association, 1908. Id.

Hampson, Sir Geo. F., Bart.—Catalogue of the Lepidoptera Phalaenæ in the British Museum :—

Vol. I.—Syntomidae. (xxi, 559 pp., and 285 woodcuts.) 1898. 15s. ;
Atlas of 17 Coloured Plates. 15s. Vol. II.—Arctiadæ (Nolinae, Lithosianæ). (xx, 589 pp., and 411 woodcuts.) 1900. 18s. ; Atlas of 18 Coloured Plates (xviii–xxxv). 15s. Vol. III.—Arctiadæ (Arctianæ) and Agaristidæ. (xix, 690 pp., and 294 woodcuts.) 1901. 15s. ; Atlas of 19 Coloured Plates (xxxvi–liv). 16s. Vol. IV.—Noctuidæ [Agrotinæ]. (xx, 689 pp., and 125 woodcuts.) 1903. 15s. ; Atlas of 23 Coloured Plates (lv–lxxvii). 16s. Vol. V.—Noctuidæ [Hadeninæ]. (xvi, 634 pp., and 172 woodcuts.) 1905. 15s. ; Atlas of 18 Coloured Plates (lxxviii–xcv). 15s. Vol. VI.—Noctuidæ [Cucullianæ]. (xiv, 532 pp., and 172 woodcuts.) 1906 ; Atlas of 12 Coloured Plates (xcvi–cvii). London : British Museum (Natural History).

France—

Marchal, P.—Utilisation des Insectes Auxiliaires Entomophages. (74 pp.) Paris: Baillière & Fils. 1907.

Germany—

Offenberg, L.—Die Bewertung landlicher Grundstücke. (119 pp.) Berlin: Parey, 1908. 2m. 50.

Steinbrück, Dr. Karl.—Handbuch der gesamten Landwirtschaft, Band I. Landwirtschaftliche Betriebslehre. (5m. 20.) Band II. Acker- und Pflanzenbau, Allgemeiner Teil. (5m. 20.) Band III. Acker- und Pflanzenbau, Spezieller Teil. (7m. 60.) Band IV. Tierzucht. (8m. 80.) Hanover: Dr. Max Janecke, 1908.

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ON THE USE OF BRACKEN AS LITTER.

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In many districts, especially where there are large stretches of sandy heaths, quantities of bracken are obtainable and are in common use for litter. Its value for this purpose appears to be considerable, and farmers who use it speak well of it. A century ago Arthur Young praised it highly, advising farmers in September to "cut fern, called in some places brakes and brakens. This is most profitable work, and should never be neglected. Carry it into the farmyard and build large stacks of it. . . . You will be able to raise immense quantities of dung and it is well known that no vegetable yields such a quantity of salts as fern, from which we are to conclude that it is well adapted to the making manure. The good farmer, in this work of bringing fern, should not confine himself to his own wastes, but purchase it of his neighbours." Whilst no careful comparison with straw seems to have been made, there is a fairly general opinion that bracken is nearly as useful as straw so far as the animals are concerned, although a competent observer has noted that the animals' coats are not so good, indicating that they do not do quite so well on bracken as on straw. Litter, however, fulfils another important function besides ministering to the comfort of the animals; it has a great effect on the composition, and particularly on the value, of the dung. This function only is dealt with in the present paper.

The simplest way of ascertaining the value of bracken as
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litter is to compare it with straw, which is by far the commonest of all littering materials, and would, as a matter of fact, be the alternative generally adopted on farms where bracken is used.

Litter contributes in at least three ways to the value of the manure. It absorbs and retains a number of valuable substances, including ammonia, that would otherwise escape as gas, and the easily soluble nitrogen compounds of the urine which might be lost either by washing out or by conversion into ammonia ; the importance of this is evident when it is remembered that the nitrogen compounds most easily lost are those most "available" for the plant and therefore of most value. It also absorbs potassium compounds which occur dissolved in the urine and are liable to be lost in the drainage water. Secondly, when it decomposes it restores to the soil those food constituents which it had during its lifetime assimilated, and which obviously have been and may again become "available" as plant food. Thirdly, during the decomposition process the stems and leaves—the "long" materials in fact—are converted into black sticky humus possessing properties of great value for improving the soil.

Bracken as an Absorbent.—All substances containing cellulose have the power of absorbing water, dissolved bodies, ammonia, &c. ; and consequently all dead plants, leaves, stems, sawdust, peat moss and similar materials possess this property. They are not all equally good, however, and naturally those which can most readily take up and retain ammonia and soluble bodies are of most value as litter. Bracken, and especially the leafy part, is better than straw, while the hard stems have about the same value ; both are, however, much below peat moss. Samples of straw and bracken were allowed to stand in contact with a weak solution of ammonia and then left to dry for two days in the air. They all retained some ammonia at the end of this time, but not equal amounts, the relative figures being :—

Bracken.			Straw.
Entire.	Leafy part.	Stems.	
70	100	33	30

It is evident that the superiority of the bracken is due to the leaves, which, being small, expose a large surface to the ammonia and facilitate the process of absorption.

In another experiment bracken was tested against peat moss, and the relative quantities of ammonia absorbed from a weak solution were as follows :—

Peat moss.	Bracken.
100	...
	25

These figures, of course, cannot lay claim to any absolute value since the relative proportion of leaf and stem in the bracken has so great an effect on its absorptive power ; they show, however, that bracken is superior, weight for weight, to straw.

The power of retaining water and soluble substances varies in the same way ; peat moss is best, bracken next, and straw third, and again bracken owes its power largely to its small leaves. These experiments were made with equal weights of material ; if, however, an equal bulk be taken, bracken is inferior to straw as an absorbent because it is so much lighter.

The Composition of Bracken.—Although bracken has long been used in agricultural practice very few analyses are recorded, and these show, as would be expected, a certain amount of variation because the composition of bracken depends to some extent on the soil on which it grows and also on the time of cutting. The young plant is richest in nitrogen and potash ; before the leaf and stem die there is probably a transference of some of the food material to the root just as takes place in certain other plants, but a good deal is left behind and the whole of this is secured if the bracken is cut in autumn as usual and kept sheltered from excessive rain. Of course if it is left out during the winter and not cut till after a great amount of washing has taken place a loss of substance is likely to result.

An important point about the composition of bracken is the large amount of nitrogen present ; usually about 1.3 per cent. is found and even higher figures are recorded. Straw, on the other hand, only contains about one-third of this, viz., .5 per cent. The amount of potash shows considerable variation, doubtless following the rather large variations in the small amounts present in the light gravelly or sandy soils where bracken commonly grows. English samples usually show about .1 per cent. ; foreign samples are considerably higher. The potash content of straw is also liable to variation, but the average is probably somewhere between .6 and 1 per

cent., so that straw is much richer than bracken in this constituent. The phosphoric acid in bracken is about .2 per cent., straw contains about the same. In the following table are given (1) analyses made by the writer of samples from Haslemere and Harpenden respectively; (2) the average composition calculated from all the analyses the writer has been able to find; (3) the average composition of English samples. For purposes of comparison the average composition of wheat straw is also included:—

—	Dry Matter.	Total Mineral Matter.	Nitrogen.	Phosphoric Acid.	Potash.
Bracken from Haslemere (Sept.)	84·36	5·87	1·30	0·19	0·16
", Harpenden (April)	83·19	3·61	1·00	0·11	0·06
Average of all analyses, English and foreign ... ... ...	...	5·12	1·33	0·26	0·50
Average of English analyses only*	86·37	4·70	1·44	0·20	0·11
Wheat straw	86·4	5·3	0·48	0·22	0·63

* Includes analyses kindly supplied to me by Dr. J. A. Voelcker and Mr. John Hughes.

The low value for the Harpenden sample, collected in April after it had been lying on the common exposed to the bleaching action of the winter rain, is interesting.

It is evident that bracken is richer than straw and the difference in value comes out still more clearly if we work out the manurial value on the unit system. There is some difficulty in fixing values in the case of bracken and straw, but on a moderate estimate, taking the value of nitrogen as 5s. per unit, of phosphoric acid as 3s. and of potash as 4s., the value as manure of English bracken in the above table is 8s. 6d. per ton, and of wheat straw 5s. 6d. per ton. Bracken is, therefore, 50 per cent. more valuable than straw so far as its content of fertilising materials is concerned.

The Composition of the Dung.—The extent to which the litter contributes to the composition of dung depends very largely on the management. If the dung is made with large quantities of litter in open yards and exposed to rain so that the urine and soluble matters generally get washed away, a large proportion of its fertilising constituents comes from the litter. When dung is made in stalls with less

litter and less liability to loss the proportion of fertilising material contributed by the animals' excretions is greatly increased and the litter plays less part except as an absorbent. Dung made from bracken may for two reasons be expected to contain more nitrogen than straw-made dung; bracken contains more nitrogen than straw and it has also a larger power of soaking up urine. The amount of potash present might be either higher or lower; bracken is poorer in potash than straw, but this deficiency is counteracted by its greater power of absorbing urine which contains the greater part of the potash voided by the animal, so that one would not expect much difference either way. These points are illustrated by the following analyses of dung made in the Haslemere district:—

	Water.	Nitrogen.	Potash.	Phosphoric Acid.
Straw-made dung	69·2	0·67	0·91	0·32
Fern-made dung...	70·2	0·71 0·90	0·90	0·28

The fern dung is somewhat richer in nitrogen than the straw dung, and contains the same amount of potash. It was the lighter of the two, weighing less than an equal bulk of the straw dung. This may have been an accidental difference in making, but if it is generally true it indicates that bracken does not get trodden in so readily as straw, in which case it would not exert its full absorptive power, and would lose much of the advantage it possesses over straw. In spite of all this, however, the fern dung comes out slightly richer than the other.

The Rate of Decomposition of the Dung.—The rate at which dung will decay in the soil is a very important factor in cases like the present, where a comparison is being made between two lots of dung made from different littering materials. The coarse, fibrous matter of which the litter is composed has properties altogether different from those possessed by the black structureless humus into which it changes on decay. Fibrous material opens up a soil and prevents settling or panning down, it has no binding tendency on a light soil but rather the reverse; it has no particular power of increasing the amount of water retained by the soil, on the contrary by opening the

soil and allowing air to enter and water vapour to escape it tends to bring about a loss of water. Humus, on the other hand, has a binding tendency, and causes a light soil to hold better together, it increases the water holding power of the soil and keeps the soil moist. The properties of fibrous material may often make it very useful on a heavy soil where its power of lightening the soil and promoting aeration is an advantage, and its drying out tendency is no disadvantage because of the ample supply of water ; but on a light dry soil fibrous material may be harmful because it leads to loss of water, of which there is already a deficit. Dung in which the litter decomposes slowly will therefore be less useful on a light soil, but may be more useful on a heavy soil than dung in which the litter rots down quickly.

The respective behaviour of straw and fern dung was investigated by marking out two small plots and digging dung into them in November at the rate of 20 tons to the acre ; one plot received the straw dung, the other the fern dung analysed above. At the end of March the ground was carefully forked over. The straw dung was found to have decomposed fairly completely into black humus, the fern dung had not, the *leaves* had decomposed, but the *stems* remained and indeed they seemed almost unaltered. It appears, then, that fern dung decomposes less rapidly in the soil and leaves behind it a larger residue of unchanged fibrous material than straw dung.

These observations enable us to explain a local preference that seems at first sight entirely a matter of prejudice. Gardeners on the light sands at Haslemere, where both straw and fern-made dung are available, prefer the straw dung and are willing to pay a higher price for it, alleging, among other reasons, that it is better and lasts longer in the soil. A little further off, however, on the heavy clay soils the fern dung is considered better. As is often the case with local preferences this is not entirely prejudice, but is capable of rational explanation. The fibrous residue remaining for some time after the application of the fern dung tends to open up the soil, to let in air and to let out water vapour on the light sand, already sufficiently aerated but insufficiently supplied with water this is a disadvantage and goes to counteract the good effect of the rest of the manure, making it on the whole probably

less useful than straw dung. On the heavier clay, the water supply is ample but the air supply is not. In this case, therefore, the lightening and opening-up effect of the fern stems is an advantage.

Conclusion.—Where bracken can be obtained its use for litter is a matter deserving serious consideration. It suits the animals, though not so well as straw.

It contains three times as much nitrogen, and as much phosphoric acid as straw, but less potash. Its manurial value is about fifty per cent. higher than that of straw. It possesses greater power of absorbing ammonia and urine than an equal weight of straw, the fine leaves especially being effective. This increased power is, however, only shown to its full extent when the bracken is trodden in as completely as straw would have been.

Dung made from bracken may be expected to be somewhat richer than dung made from straw. On the other hand, it takes longer to decompose in the soil, the fibrous woody stems being only very slowly attacked. It therefore opens up the soil to a greater extent than straw-made dung would do, and is for that reason likely to be more effective on a heavy clay than on a light sandy soil.

COMPETITION IN APPLE GROWING.

WILLIAM E. BEAR.

The practice adopted by the majority of growers of selling their fruit immediately it has been gathered has often been criticised. They have been told that this practice produces a glut in the markets in the autumn and thus brings prices down to a low level, and they have been urged to store the keeping varieties for the winter trade. By spreading their sales over a longer period they have been assured they would obtain better returns than they now receive.

It is an undoubted fact that the plan of selling referred to frequently causes a glut in the markets during the autumn, and that prices fall in consequence. This is particularly the case while windfalls are being sold, and it may perhaps be taken for granted that the storing of apples which will keep for a month or more would be profitable during the windfall season, a condition which would apply to nearly all cooking

apples and to all but the early dessert varieties. Such a limited application of the advice mentioned above, however, would not satisfy the fruit growers' critics, and it seems worth while to consider whether its fuller adoption would be advisable.

There are several reasons for the sale of apples direct from the trees. In the first place, not one grower in twenty, and probably not one in fifty, has a properly constructed fruit chamber, and no one who understands the subject would recommend storing for months in any other place. This reason, however, would not prevent storing if it were likely to prove remunerative, one year with another, as the expense of erecting a fruit room proportionate in size to the apple orchard is small. Secondly, there is much economy in labour when fruit is marketed direct from the trees; and, thirdly, there is the still more important saving of losses from shrinkage of weight and rotting. But the governing reason for the practice of selling direct from the trees is the impression that, except for choice dessert apples, it is advisable for British growers to sell their fruit before the supplies from the United States and Canada reach our markets in considerable bulk. In other words, rightly or wrongly, the great majority of our fruit growers are of opinion that it would not pay them to incur the expense and loss of storing culinary apples in order to compete with growers on the other side of the Atlantic. There is other competition it is true, but the supplies from the Continent of Europe are insignificant in comparison with the imports from the United States and Canada; and, as for the receipts from Australia and Tasmania, they do not arrive until nearly all home-grown apples are out of season. Our average annual imports in the last five years have been, in round figures, 3,634,000 cwts; and about eight-tenths of this quantity have come from the United States and Canada, one-tenth from Australasia, and the remaining tenth from the Continent of Europe and the Channel Islands. Seeing that the Australasian supply does not directly compete with home produce, it is clear that the competition of American and Canadian growers is the only consideration to be taken into account.

Now the prices of American and Canadian apples vary considerably in different seasons; but, except in years of very

short crops, cooking apples seldom make more than 4s. to 5s. per bushel in the wholesale markets of this country, and in seasons of great yield the range of prices is lower. Taking the range given as about an average, and bearing in mind the fact that the apples are all selected, ranking in size with English "firsts," it must be admitted that there is not much temptation to English growers to store apples to sell against them. It is true that the quality of our home-grown apples is greatly superior to that of those produced in the United States or Canada; but British consumers are remarkably indiscriminating in relation to the flavour of cooking apples. They judge almost exclusively by size and colour, in which respects English fruit needs to be very carefully graded to excel the transatlantic supplies.

It is to be borne in mind that if a large proportion of the home crop were kept to sell after American and Canadian supplies were in our markets, the prices of the latter, and also of the home supply would be reduced. But if the result of storing a large proportion of the home crop of cooking apples were to be the reduction of the average price of "firsts" of home and outside production alike to 3s. a bushel, who would be the first to give up the competition which had such a result?

There are many reasons for supposing that home producers would prove the weaker competitors, and that they would be driven back to their present plan of selling the bulk of their apples before the end of November. Good fruit land, of course, is very much cheaper to buy or hire in the United States or Canada than in this country. Apart from California and British Columbia, unplanted land suitable for apples can be bought at the low prices of ordinary farm land, whereas, in some of the best fruit districts of England, it commands £100 per acre. Fruit growers on the other side of the Atlantic almost all own the land they plant, and when they do the work well and attend to their trees properly their farms grow in value greatly. In England, on the other hand, most of the fruit land is hired on an imperfect tenure as to security for improvements, and planted land in full profit in some districts lets at £8 to £10 per acre.

Again, for regular fruitfulness of apple trees the United

States and Canada appear to be superior to this country, although in exceptional seasons crops are badly damaged or even destroyed by frost. The trees grow to a much greater size than those of England, and, although there are fewer to the acre, the yield per acre, so far as statistics are available, appears to be higher.

Insect pests are at least as numerous in the over-sea countries as in our own. The larvæ of the Codlin and Winter Moth cause extensive damage in the former countries, while the scale is very much more injurious. On the other hand, so far as can be judged from reports, there is less injury from the aphis and the apple sucker. Whether fungus diseases are as rampant and varied in the United States and Canada as they are in the United Kingdom is doubtful, but canker and scab appear to be equally troublesome.

While the expense of barrels is a serious deduction from the gross returns of American and Canadian apple growers, it must be borne in mind that English producers have indirectly to pay for the cost of the baskets supplied to them by salesmen. As to cost of transport, ocean rates are but little if any more for thousands of miles than rail rates in this country are for a hundred miles.

Although wages are higher in the United States and Canada than they are in Great Britain, the expenses of fruit farming labour are less. In the first place, except where the trees are grown on grass land, the cultivation on the other side of the Atlantic is nearly all done by horse implements, for the working of which there is plenty of room between the widely-planted trees. Therefore the very heavy expense of hand digging and hoeing is almost, if not entirely, avoided. The labourers, too, are employed only casually, and a good deal more work is got out of them in a day than can be obtained in this country. Such returns of the cost of working apple orchards as are available show a large balance of expense against the English fruit grower.

In short, there is no doubt that the cost of producing apples per acre is very much lower in the United States and Canada than it is in England. A comparison of the cost of producing a given quantity is less simple. In the former countries at least, apart from California and British Columbia, large

standard trees are generally grown, only thirty permanent trees as a rule to the acre, though in recent plantings it has become common to place a "filler" between each pair of permanent trees, to bear fruit until it becomes overshadowed and has to be removed, and dwarf trees are also now coming into favour. In this country it is usual to grow gooseberries or currants as "fillers," and even full standards are 50 per cent. more to the acre than they are on the other side of the Atlantic, while our dwarfs are ten times as numerous per acre; but, in an average of seasons, apart from the yields of "fillers," I believe that the production of apples per acre is greater in these outside countries than in our own. Indeed, the question of the yield of "fillers" applies only to young plantations, and the statistics to be noticed presently nearly all relate to the yields and returns of old orchards.

From a series of articles in the *Rural New Yorker*, on questions connected with apple growing in the United States, some remarkable reports of yield and money return have been extracted. Nearly all are records of results obtained in New York State.

The first is that of an orchard of 9 acres only 9 years old, in which the trees were planted somewhat more thickly than they usually are, 46 permanent trees and an equal number of "fillers." There are 825 trees in all, and the yield in 1907 was 1,734 bushels suitable for packing, or $2\frac{1}{10}$ bushels per tree, a remarkably good yield for so young an orchard. No account is given of the yield of seconds or tail fruit, and apparently the money return, £49 per acre, was that of the barrelled fruit only. Some of the trees, it is stated, had grown to a spread of 20 feet. The cost of tillage by horse and hand, pruning and spraying—in short of all work except the harvesting and packing of the fruit—was only 36s. 6d. per acre.

In a small orchard of 26 trees, presumably on less than an acre, the crop in 1907 was 558 bushels suitable for packing, or $21\frac{1}{2}$ bushels per tree. Nineteen of the trees were 75 years old and the rest were 35 years of age; one tree produced 36 bushels which sold for £10. The variety was Northern Spy, which sells at a higher price than the ordinary Baldwin, Ben Davis or Greening, and the money return, including a small sum for windfalls, was £186; a great amount to obtain from less than an acre.

Next we have an account of an orchard of 11 acres, with the yields of the last 6 years, which average 3,627 bushels, or 330 bushels per acre of "firsts," sold in barrels at £337, or £30 13s. per acre. Nothing is said about the yield or sale of the inferior apples.

Another orchard of 18 acres, the trees being about 35 years old, has yielded from 300 to 483 bushels per acre per annum in the last 6 years. The average money return was £54 13s. per acre.

From 25 acres of Baldwin and Greening apple trees, 30 to 40 years of age, the average annual yield for the last 6 years was 327 bushels per acre, and the average money return was £55 9s. per acre. Here again the yield and money returns of windfalls and other inferior fruit are not noticed. Possibly they were sold as food for pigs, but in many cases they are cut into rings or pieces of other form and dried, or made into cider.

The largest return given is that of a small grower. As he has only 25 trees his orchard is almost certainly less than an acre in extent. In 1907 he obtained 1,000 bushels, or 40 bushels per tree, and made £208 from the whole crop, or over £8 per tree. More moderate but still a good return from 20 acres in 1907 was £1,458, or £72 18s. per acre.

The most remarkable account of yield is one of several Baldwin apple trees which produced from 36 to 54 bushels each, while one gave 60 bushels. The money return in this case is not given, but it must have been high.

It is hardly necessary to say that these great yields and money returns are extraordinary; but it is questionable whether they could be matched by the best of returns in this country. On several occasions it has been officially reported that the average yield of apples in Canada from bearing trees of all ages was 6 bushels per tree, one year with another. Considering the small amount yielded by the large proportion of very young trees, this is very good. As the proportion of mature orchards is higher in the United States the average yield per tree is probably higher.

Fruit growers in this country are less communicative than those of the North American Continent, and there are no reports of yield to compare with those given above. Our apple crop varies enormously in different seasons, and returns of results

for a series of years would be necessary in order to afford a fair representation of the average yield. That the quantity per tree would come out much lower than in the United States or Canada may be regarded as certain ; but whether or not the extra number of trees in a given space would bring the yield per acre up to that of those countries is doubtful. There is no official return of the yield of apples per acre in any country, and the average per tree of bearing age returned in Ontario as representing Canada is not sufficient, as the average number of trees per acre is not known.

Some years ago, after an inquiry made among Kentish fruit growers, Mr. Cecil H. Hooper estimated the yield of standard apple trees in full bearing at 10 tons per acre, or 466 bushels of 48 lb. This, of course, would be greatly in excess of the average for trees of all conditions, including young and very old ones. The number of trees per acre is not given, and it is uncertain whether half-standards were included. The estimate for "dwarfs" in full bearing is 5 to 7 tons per acre, the mean of which would be equal to 280 bushels. Here again there is uncertainty as to whether half-standards are included with bush-shaped trees. Besides, an inquiry made among a limited number of growers in Kent cannot be regarded as affording satisfactory guidance as to the average yield in the country at large. There is no doubt that the yield per acre in Kent is much above that of the whole of England.

But whatever conclusion might be derived from an approximately accurate comparison of the yields of apples per acre in the countries under notice, it would not settle the question as to the probable advantage or disadvantage to English growers of attempting to compete on an extensive scale with the United States and Canada in the winter supply. As already stated, the English grower's expenses are vastly greater than those of his rivals, and therefore he would need much larger crops to enable him to undersell those competitors. There is abundant evidence to the effect that well-managed apple orchards in the United States and Canada yield much larger profits than the corn crops of those countries, and that extensive planting of trees is constantly going on. As this country is the only considerable market for the surplus production of the Continent of North America, apples would continue

to be sent to us even if prices were reduced to the minimum which would leave any profit at all.

Hitherto the competition in the sale of early apples has been almost entirely between home producers. Efforts have been made by the American Department of Agriculture to induce growers in the United States to engage in the early autumn trade of this country, even to the extent of guaranteeing certain minimum returns. Fortunately for home growers, however, early apples do not travel long distances well, the time occupied leading to a loss of flavour in most varieties, while the production of such fruit in the United States is comparatively small at present. British Columbia has begun to export early apples to this country, but not in great quantity. At present, therefore, the practice of selling the bulk of the culinary apples produced in this country by the end of November appears to be dictated by sound business policy. If, at any future time, early supplies should become as much subject to outside competition as the late ones are already, the subject would have a different aspect and one of serious import to the home producer.

SUPPRESSION OF TUBERCULOSIS AMONG CATTLE ON THE CONTINENT.

During the last fifteen years many European countries have made more or less systematic attempts to eradicate or control tuberculosis among their cattle. In some cases they have relied on the extensive employment of tuberculin as a means of ascertaining the existence of the disease, in others steps have merely been taken to slaughter animals clinically affected. No sufficient period has yet elapsed to enable any definite opinion to be formed of the success of these efforts, but it may be useful to give a brief account of the different systems adopted.

Denmark.—Denmark was one of the first countries in which State aid was afforded to the suppression of tuberculosis, and it took the form in 1893 of an annual grant of £2,800 for the assistance of cattle owners who wished to make use of tuberculin as a diagnostic means of combating tuberculosis among their young cattle, provided that the injections were made in accordance with regulations of the Ministry of

Agriculture, and that isolation was satisfactorily carried out. By a law dated 26th March, 1898,* the grant was doubled and made applicable to cattle of all kinds, instead of to young cattle only. Imported cattle not intended for slaughter were required to be tested, and those reacting were to be either refused admittance or killed. Native cattle found to be attacked by tuberculosis of the udder were required to be slaughtered, a portion of the value being paid as compensation. Milk or butter-milk supplied by dairies as food for animals was required to be heated to a temperature of 185° F. (afterwards reduced to 176° F.). This latter provision was intended to prevent the infection of calves by the mixed separated milk returned by the butter factories.

The method adopted, which is based on the recommendations of Dr. Bang, aims at the extirpation of bovine tuberculosis by the voluntary action of cattle owners, who are assisted in their efforts by the gratuitous inoculation of tuberculin by the State veterinary officers, the owners on their part providing for the isolation of the reacting animals and their slaughter when fat, and for disinfection of buildings, &c.

The system is for the whole herd on a farm to be first inoculated and the animals which react separated from those which do not. No fresh cattle are added to the group of healthy animals unless they have been tested and found free from disease, and the whole of this non-tuberculous herd is tested annually or at intervals to ensure that tuberculosis has not appeared among them. The reacting group is treated as a separate herd, and either fattened for the butcher at once or reserved for future disposal at the will of the owner.

Calves born of reacting cattle are removed immediately after birth to the healthy herd, and, in order to avoid inoculating them by means of infected milk, all milk given to them is first sterilised by heating.

Dr. Bang, in a paper read before the Eighth International Veterinary Congress at Buda Pest in 1905, stated that, up to 1904, 17,268 herds containing 404,651 animals had been inoculated, of which 97,070, or 24 per cent., reacted. The number of reactions, however, exhibited some reduction in the later years, the proportion in 1903 and 1904 being 14.8 and

* *Journal*, Vol. V, p. 74, June, 1898.

16·2 per cent. Dr. Bang considers that his experience in Denmark shows the isolation system to be perfectly sound as a method of transforming an infected herd into a perfectly healthy one. The system, however, works slowly, and demands a clear conception of the nature of tuberculosis, as well as perseverance and care in carrying out the rules. The fact that it needs to be followed for a series of years occasionally causes farmers to lose interest in the matter after a time, with the result that the system is not always satisfactorily carried out. There is also a certain difficulty in securing proper isolation, especially where the proportion of reacting cattle is large. This, however, is rather a question of trouble than expense, and Dr. Bang gives numerous examples of cases, both on large and small farms, where completely healthy herds have gradually been built up at no appreciable extra cost.

In this connection it may be mentioned that an agricultural association, called the Tuberculin Association, has been started, the aim of which is to increase the interest in the acquisition and maintenance of herds of cattle and swine free from tuberculosis. In September, 1906, the association had 105 members, owning 2,300 cows. To be a member it is necessary that the farmer should have his live stock tested with tuberculin, and that this live stock should be found sound or partly sound. In the latter case it is required by the association that the sick animals should be effectively isolated from the sound, in the manner prescribed by the society.*

Norway.—The gratuitous distribution of tuberculin by the State in Norway began in 1892, and in 1895 a Government grant of £550 was made with a view to the systematic extirpation of tuberculosis.

The method adopted is described in a circular letter from the Director of the Norwegian Civil Veterinary Department, dated 7th April, 1905, which states that the presence of tuberculosis in a herd is to be reported to the authorities by the owner, who is forbidden to take suspected animals to markets or shows or to common pasture, but such animals may be sold for slaughter. Permission to have a herd tested at the public expense is granted on application by the owner, who must undertake—
(1) To isolate the tuberculous animals from the remainder of

* F.O. Report, Annual Series, No. 3862.

the herd ; (2) to disinfect the premises ; (3) to slaughter immediately any animal suffering from tuberculosis of the udder or the lungs, and not to sell or use its milk unless it has been boiled ; (4) to have new-born and newly acquired animals tested with tuberculin at his own expense before they are placed with the healthy animals ; and (5) to have tuberculous or suspected animals branded with a "T" on the hide or horns. In certain cases the test will be repeated free of charge. The State veterinary surgeon who carries out the test is instructed to give the owner the necessary directions as to isolation, separate attendance, &c., with a view to the eradication of the disease. The compensation given by the State for the slaughter of tuberculous animals is not intended to cover more than one-third of the loss incurred, the value of the hide and carcase being deducted from the estimated value. The owner who wishes to receive this compensation must undertake to have those animals slaughtered which, after testing, are declared to be tuberculous, and to have the herd annually tested until it is considered free from tuberculosis.

According to the report of the Norwegian Veterinary Department for 1904, it appears that in the period 1895-1905, 178,000 animals on 20,485 farms have been tested, of which 10,384, or 5.8 per cent., were found infected. In the first two years the percentage was about 8.4, in 1901 it fell to 3.2, but rose again in 1904 and 1905 to 5.7 and 4.6 per cent. As the test is carried out on the voluntary application of the owners, it is found that the interest in the question varies very much in different districts. In some parts there is very little sympathy with the movement ; elsewhere, on the contrary, the desire to eradicate the disease is very strong. In the Commune of Snadsen, where breeding is extensively carried on, the municipality pays compensation for the slaughter of tuberculous cattle to the extent of one-fourth of the value in addition to that granted by the State. In other cantons frequent tests are made, and in the west a number of agriculturists have slaughtered out their cattle, rebuilt their cattle-sheds and formed entirely new herds with a view of eradicating the disease.

Dr. Malm, the Director of the Veterinary Department,* thinks that a more rapid result may be hoped for in Norway

* *La Lutte contre la tuberculose bovine, 1903.*

than in some other countries owing to the fact that the animals which react are nearly always slaughtered, as the obligatory marking makes the sale of tuberculous animals almost impossible. The number of animals, however, which had been tested up to 1905 was less than one-fifth of the total number of cattle in Norway.

Sweden.—The efforts made in Sweden with a view to the extirpation of tuberculosis have taken the form of the free inoculation of cattle at the expense of the State, together with veterinary advice and assistance, but without any compulsory requirements as to isolation, slaughter, &c. In the years 1897-1904, 226,864 cattle on 8,698 farms were tested, of which 30·7 per cent. reacted. The farms on which cattle were tested a second time may perhaps be taken as representing those on which suppressive measures are taken, and the number of these is comparatively small though it is steadily increasing. In 1904 the figures were 810 farms with 36,149 cattle, and on these the proportion of reacting cattle was only about 4·7 per cent. The measures recommended by the Government Veterinary Department are based on the methods of Dr. Bang as regards isolation, sterilisation of milk fed to calves and disinfection of cow-houses. Tuberculosis of the udder is dealt with separately.

Holland.—Since January, 1905, a Royal Decree, dated 2nd September, 1904, has been in operation in the Netherlands, according to which every cattle owner, provided he is not a dealer, has the right to offer cattle showing symptoms of tuberculosis to the State. Only such animals are taken over by the State as show clinical symptoms of tuberculosis, but a bacteriological examination may be made when the district veterinary surgeon is in doubt as to the symptoms. Tuberculin is also used in cases of doubt, but animals which appear to be healthy are not tested with tuberculin. When a tuberculous animal is taken over from a cattle owner by the State and slaughtered, all the horned cattle of the owner are examined as to the presence of clinical tuberculosis, and every animal which at that examination is found to be suffering is expropriated and slaughtered. This examination may be repeated.

The animals offered to the State are taken over at the value which they still had for business and trade at the moment of

the valuation. The State bears all expenses connected with the matter. The flesh of the slaughtered animals is examined, and, if approved, is allowed to be consumed. In the course of three years about 20,000 head of horned cattle have been offered by cattle owners to the State, and, after examination by veterinary surgeons, 12,000 of these were taken over and slaughtered; 8,000 were rejected as not suffering from tuberculosis. About 83 per cent. of the animals slaughtered were suffering from tuberculosis and about 17 per cent. from other diseases.

Belgium.—The system at present in force dates from 1897, when the sale, exhibition or exchange of breeding animals clinically affected or suspected of tuberculosis was prohibited. This prohibition, however, has since been withdrawn. Cattle clinically affected may be ordered to be slaughtered by the veterinary inspector, but testing with tuberculin is voluntary, and the owner can keep reacting animals for three years. The owners of slaughtered animals receive compensation to the extent of 70 per cent. of the value; half value is allowed for pigs. Imported cattle are submitted to the tuberculin test.

In 1905, out of 426,000 cattle slaughtered at the abattoirs, 16,571, or 3·9 per cent., were found tuberculous; in addition, 2,646 were ordered to be slaughtered as clinically affected.* It appears that the owners of tuberculous cattle very often prefer to sell their animals to low-class butchers rather than report them to the veterinary inspector, and, in any case, only report them at a very late date; whereas, to prevent the spread of infection, the slaughter of clinically-affected cattle should take place at the earliest possible date. The tuberculin test was carried out on 149 farms in 1905, on 18 of which no tuberculous animals were found. The total number of cattle tested was 2,805, of which 52 per cent. reacted; many of the farms, however, where the test was carried out had long been recognised as centres of tuberculosis. Cattle owners in many cases object to the test owing to the depreciation in value which results in the case of reacting animals, and it would seem that there are very few farms on which any serious attempt at the formation of non-tuberculous herds has been made. The test was applied a second time on 21 farms in

* Bulletin du Service de la Police Sanitaire des Animaux Domestiques, 1906 No. 25b.

1905-6, and the proportion of reacting cattle on these farms was found to be 32 per cent., compared with 51 per cent. at the time of the first inoculation ; but apparently the necessary precautions as to isolation and testing of new animals were not fully carried out at all the places.

The official report states that since the withdrawal of the prohibition of the sale of affected animals the trade in diseased cattle has increased, and most of the veterinary inspectors consider that the disease has become more prevalent in consequence.

Germany.—No organised methods have, up to the present, been taken against tuberculosis in Germany, except as regards imported cattle, which are submitted to the tuberculin test. In the introduction to a Bill for the amendment of the law as to suppression of animal diseases, which was laid before the Reichstag in November, 1907, it is observed that this disease is most widely spread. Out of 3,329,000 cattle slaughtered in 1904, 595,500, or 17·9 per cent., were found to be affected with tuberculosis ; moreover, the statistics for the separate States, so far as they are available, suggest that there has been a very material increase in the disease in recent years, thus the proportion of tuberculous animals among slaughtered cattle in Prussia has risen from 6·2 in 1890 to 20·3 per cent. in 1904, in Bavaria from 5·0 per cent. in 1895 to 9·20 per cent. in 1904, and in Saxony from 27·5 per cent. in 1895 to 34·5 per cent. in 1904. Some portion of the increase, however, is probably due to an improvement in the methods of inspection. Any attempt to deal with tuberculosis generally would, it is considered, be too great a task, and the Bill therefore proposes to deal only with tuberculosis of the lungs in an advanced stage, and tuberculosis of the intestines, uterus and udder. Cattle thus affected can be slaughtered by order of the authorities, and the police have power to make regulations to prevent the spread of disease, &c. Milk from such cattle is not to be disposed of until it has been properly sterilised. Compensation is to be paid at the rate of four-fifths of the normal value.

This proposed law has evidently been framed with some reference to the method of Dr. Ostertag, which has been adopted by the East Prussian Herdbook Society for Dutch Cattle. This system differs from that of Dr. Bang in that it relies on clinical

and bacteriological examination for the discovery of tuberculosis. Cattle are examined twice a year by a veterinary surgeon, and any which present symptoms of contagious tuberculosis, viz., pulmonary tuberculosis and tuberculosis of the intestines, uterus and udder are slaughtered. Calves are brought up separately from other cattle and fed exclusively on cooked milk, but are ultimately put with the other cattle. By this method, which consists in the preservation of healthy cattle and the gradual elimination of those attacked in a contagious form, Ostertag considers that the disease can be so reduced that the tuberculin test could be applied without much loss to the remainder, and the disease entirely eradicated. In the herds of the East Prussian Society, containing 28,150 head of cattle, the proportion of dangerously infectious cattle in 1900-1902 was 2½ per cent.; in Saxony and Anhalt, where 14,050 cattle were examined, the proportion was found to be 3·6 in 1903, in the following year it was reduced to 1·6, in 1905 some 5,300 additional cattle were included and the proportion was 2·5, but in 1906 this proportion had again been reduced by one-half. The memorandum on the German Bill mentioned above assumes therefore that not more than 2 per cent. of the cattle in Germany would be affected by the proposed measure, and that this proportion would be gradually reduced.

France.—Revised regulations as to tuberculosis in France were made by a Decree dated 6th October, 1904,* which requires animals presenting clinical signs of tuberculosis to be slaughtered by direction of the authorities. The presence of the disease having been confirmed, the premises from which the animal came are to be declared infected and the sale of animals thereon is prohibited except for slaughter. The owner may then have them tested with tuberculin. Those which react can only be sold for slaughter but they may be retained for an indefinite period; those which do not react must be immediately separated from the others and isolated in disinfected premises. They can then be disposed of at the will of the owner. Calves born of reacting cows must, if kept with the cow, be marked; but if separated at once and placed with the healthy animals, can be dealt with without restriction. The declaration as to the infected premises can only be removed when all the con-

* Bulletin Mensuel, 1905, p. 1319.

taminated animals have been killed and the premises disinfected. The portion of the premises reserved for the non-reacting animals can, however, be declared free after disinfection.

Compensation for animals slaughtered by order is paid at the rate of one-third of the value in the case of general tuberculosis, three-fourths in the case of "local" tuberculosis, and full value if the animal after slaughter is found not to be affected with the disease. The value of the carcase, however, is deducted from this amount, and the State only pays the difference between the carcase value and the full compensation allowed.

The order for slaughter is only to be given on the advice of two official veterinary surgeons.

THE IMPROVEMENT OF WOODLAND.

ROBERT ANDERSON.

The ancient existing woods in the Midlands and south of England are almost invariably composed of coppice with standards, at one time a profitable crop, but now generally discredited except for sporting purposes, the coppice wood having in many districts become unsaleable, while the standards growing in it are short stemmed and branchy, and of less value than the clean straight boles produced in high forest. This description of woodland is also the most difficult to manage, and the difficulty is accentuated where rabbits have destroyed the saplings that should have provided the necessary succession, often resulting in trees being left standing for the sake of appearance until they have depreciated in value. It is generally admitted that such woods do not produce a proper return, and must as time goes on produce still less. Various schemes have therefore been put forward with the object of converting them into high forest, which when attained should result in a higher annual increment of timber and greater simplicity of management. High forest is, however, useless as a game covert, since pheasants will not remain under the dense shade that is essential to the system, and enough consideration does not seem to have been given to a landowner's not unreasonable desire that his property should provide him with a certain amount of pleasure, since he himself is not likely to enjoy the profit that he is advised will be the result of conversion. It is therefore necessary to devise a working

plan that will admit of sufficient covert for winged game, and at the same time result in a greater production of timber per acre than is usually obtained under existing conditions.

The scheme of management to be described was prepared for a large area of coppice with standards that, having carried a stock of rabbits for forty years, possesses no standards of that age or under, except the few survivors of those that have been planted and protected. The soil is stonebrash overlying the Oolite, dry, of only moderate fertility, and from 4 to 8 in. in depth. The species that can be profitably grown are limited, as sweet chestnut and Douglas fir do not thrive, and there is not sufficient depth, staple and moisture for oak, ash and elm timber. Beech and larch of good quality are, however, produced, and these will be favoured as standards, with sycamore and ash for coppice. Little financial return is, however, expected from coppice which is provided to give covert, but cut on a twenty year rotation it will assist the growth of the standards by cleaning the stems from side branches and keeping the soil protected.

Since these woods are understocked in the younger age classes and overstocked in the others, the scheme involves the gradual clearing of old trees that are deteriorating and at present occupy an undue area of ground. The open spaces that will result extend in many cases to upwards of one-eighth of an acre, and these will be planted up for the most part with larch and beech, about 4 to 5 ft. apart, in the proportion of two to one, while gaps in the coppice will be mended with ash and sycamore. Since, however, at the third felling there will be a deficiency of old standards, some of the spaces will be wholly filled with larch of the Japanese species, as giving a greater return of timber at a less age than *Larix Europaea*. Most of the poles will have been felled in forty years, the remainder being allowed to go through another rotation before being cleared, when the spaces will be planted with beech and larch as before.

Eventually this will result in a wood in which the timber trees will stand in age-classes in separate groups, divided by patches of coppice, the former being cleaner and longer stemmed than if the standards were scattered among the underwood, while the management will be simplified.

The rotation of the coppice being twenty years, one-twentieth of the whole area is to be annually dealt with. At that age it will be cut and laid in drifts for sale or conversion, all the maiden poles being left standing. The timber trees to be removed will then be marked and felled, and lastly the best poles selected to remain; the rest being cut and laid with the coppice to provide fresh stools.

As a general illustration the following table is given. It is of course not possible to work exactly to these numbers per acre, but in an annual kerf of about 80 acres, for which this scheme was prepared, it should be possible to have an average proportion over the whole area.

DISTRIBUTION of Standards per Acre.

Description.	Age. Years.	Stock before felling.			Removed.			Remaining.		
		Beech.	Larch.	Total.	Beech.	Larch.	Total.	Beech.	Larch.	Total.
Poles ...	20	—	—	—	—	—	—	20	30	50
Large poles...	40	20	30	50	—	10	10	20	20	40
Young trees	60	20	20	40	10	10	20	10	10	20
Trees ...	80	10	10	20	5	10	15	—	—	—
Old trees ...	100	5	—	5	5	—	5	—	—	5
Total ...	—	55	60	115	20	30	50	55	60	115

Until the woods have been under this course of management for a considerable period the full results will not be realised, and at first the returns will chiefly depend on the stock at the commencement, but when in full profit the average annual fall per acre should be ten larch of forty years, ten larch and ten beech of sixty years, ten larch and five beech of eighty years, and five beech of 100 years' growth respectively. According to circumstances these may be estimated to aggregate from 700 to 1,000 ft. of timber, equal to an annual average return of 35 to 50 ft. of timber per acre over the whole area irrespective of coppice.

Such results cannot, of course, be expected where ground game is allowed to prevail, and in ordinary cases some expense must be incurred in protecting the young groups with wire

netting. On the other hand, if rabbits are not only "kept under," but exterminated, which is not impracticable, no expense need be incurred in planting any species except larch, since natural reproduction from parent standards will carpet the open spaces with seedlings.

The condition of a large proportion of woodland being of very similar character to that under review it is believed that increased production may generally be attained by treatment on similar lines. Soil, situation and climate will indicate the species to be profitably planted, and where conditions are favourable ash is the most profitable standard. It is, however, impossible in a short paper to deal with the varied circumstances that may be encountered, enough having been said to indicate generally the objects to be kept in view and the means by which they may be attained.

A description and coloured illustration of a poisonous fungus, *Amanita phalloides*, which had been prepared for issue in this number has been unavoidably held over owing to a delay in printing the coloured plate.

MOTHS.—*Potato Moths*.—Enquiries have been made as to a pest termed the "potato moth." It may be said that there is no

moth to which this term generally applies,

**Notes on Insect,
Fungus and other
Pests.** but the caterpillars of several moths attack the potato. The caterpillars of the

Death's Head Moth (*Acherontia atropos*) hide or remain motionless during the day and feed at night on the potato leaves, &c. These caterpillars attain 4 or 5 in. in length, are lightish green in colour, and bear seven purplish streaks slanting across the sides. Numerous black spots occur on the back and a row of black tubercles along each side. They have sixteen legs and a hard crinkled tail. They are seldom very harmful, and are not at all common.

The caterpillars of the Rosy Rustic Moth (*Hydraecia micacea*) feed on various plants, and have now and again been reported as infesting potatoes. They are very harmful, as they tunnel the stems and so cause the death of the shoot.

The larvæ of the Frosted Orange Moth (*Cortyna flavago*) also infest potatoes, feeding, like *H. micacea*, in the stems.

Buff Tip Moth.—Caterpillars of this moth (*Pygaera bucephala*) were found on fruit trees at Wooburn (Bucks).

Cabbage Butterfly.—Specimens of the caterpillars of the large White Cabbage Butterfly (*Pieris brassicæ*, L.) were received from Mansfield, where they were infesting cabbages, and the same species appeared to be attacking cauliflowers at Heckington (Lincs.). Where cabbages are infested the application of soap suds, lime, or soot water, or dusting the plants when damp with soot or lime, will have a beneficial effect. The caterpillars may also be hand-picked and destroyed, or they may be washed off the plants by the use of the hose or garden engine and subsequently destroyed. The application of liquid manure aids the plants to resist attack. Lime, soot, or soap suds can hardly be applied in the case of cauliflowers if the plants are approaching marketable condition. In this case the only course is to hand-pick the caterpillars, or wash them off the plants with a stream of clean water—the colder the better—and then destroy them. All collections of rubbish, weeds round fences, &c., which tend to shelter the chrysalids, should be cleared away, and all chrysalids found should be destroyed.

SAWFLIES.—The large Larch Sawfly (*Nematus Erichsoni*) was reported on 31st August from Cockermouth. This pest is included under the Insects and Pests Order of 1908, and must be reported to the Board as soon as it is discovered. It is fully described in Leaflet No. 186.

Reports from Much Hadham and Snaresbrook show that the caterpillars of the Gooseberry Sawfly (Leaflet No. 12) were attacking gooseberry and red currant bushes.

APHIDES, &c.—Palm leaves from Ramsgate were found to be infested with the scale insect *Aspidiotus hederæ*, Vall., one of the commonest of greenhouse pests. It is particularly injurious to palms. Infested plants should be washed with a soft soap solution or sprayed with a paraffin emulsion. Market growers keep their palms clean by spraying them periodically about once a month, with a paraffin emulsion or a nicotine preparation.

A grape vine at Palmer's Green was infested by a scale insect,

apparently the immature form of the "Cottony Cushion Scale" (*Pulvinaria vitis*). In its adult stage this insect rests upon a large white cushion or pad of flocculent matter, which is really the egg-sac. Against this pest spraying with paraffin emulsion should be practised.

A specimen of Brown Scale on gooseberry bushes (see *Journal*, June, 1908, p. 195) was forwarded from Bawtry.

Cabbages infested with aphides were forwarded from King's Lynn. Spraying with paraffin and soft soap emulsion is probably the only efficient remedy, although dusting the plants with soot, or with lime and soot mixed, might do some good. Badly attacked leaves should be removed and burned. The plants should receive plenty of water, or preferably liquid manure, in order to strengthen them against attack, and to keep up a flow of sap.

In reference to the note which appeared in the *Journal* for September last, p. 436, on the subject of oat aphides, the Board are informed that the damage varied considerably, being greatest where the crop was very light, while the pests were seldom found to attack a heavy crop to a serious extent. It was, however, estimated that in the case of one field the value of the straw was reduced by one-half. In another instance half a field was sown with oats and half with barley; the oats were badly affected with aphides, while none could be found on the barley.

Specimens of beans affected with aphides were received from Rugeley; *aphis*-infested larch from Bridlington and *aphis*-infested spruce and Scotch pine from Morpeth.

· VARIOUS PESTS.—Potatoes from Kettering were found to be hollowed out by the eelworm (*Aphelenchus pyri*, Bastian). Green stable manure should not be used in the rows when planting.

"*Purples*" or "*Ear Cockles*."—Ears of wheat from Barton Stacey (Hants) were affected by this disease, which is due to the eelworm *Tylenchus tritici*, Bastian. Wheat is most subject to attack, but other cereals are sometimes infested. Affected grain should not be used as seed, though steeping it in a solution of sulphate of copper is recommended as a remedy. If the liquid is allowed to rise above the corn, and gently stirred, the diseased grains will float and can be skimmed off.

Peach leaves attacked by red spiders (Leaflet No. 41) were received from Norwich, and parsley roots apparently bitten by wireworms (Leaflet No. 10) from Holmes Chapel. Potatoes from Southfields (London), Harwich, Burnham (Somerset), and Honiton, were found to be somewhat scabby. The cause of this surface scabbing has been usually attributed to physical properties of the soil, but more recently it has been thought to be due to the millipede *Julus pulchellus* (Leaflet No. 94). This pest is often introduced with manure, especially when the latter contains much dry decaying vegetable matter. A dressing of sulphate of potash checks the spread of this and allied millipedes.

FUNGI.—A considerable number of cases of Wart Disease or Black Scab of Potatoes, were brought to the notice of the Board. Up to 3rd October the disease had been reported in 18 counties. (See p. 548)

Diseased Mint.—Leaves of the peppermint plant from Westerham were affected with *Puccinia menthae*, Pers., a well known pest on mint, both wild and cultivated. The disease is commonly called "snuff," the "snuff" consisting of the spores of the fungus, which are produced on the leaves in immense numbers. Spraying or sulphuring is of no avail even if practicable, and the fungi on the fallen leaves will in all probability renew the disease next season, unless destroyed by burning. In the case of strawberries and certain other crops having infected foliage, just about this season of the year, when the foliage is fading, the infected patches are covered with a sprinkling of straw or other litter that will burn readily. This is fired, the result being the destruction of diseased leaves, whether attached to the plant or lying on the ground; spores on the soil are also killed. This mode of treatment does not injure strawberry plants in any way, while at the same time clearing away all infected material. The same method of treatment would probably answer in the case of peppermint, after the crop had been cut, or at any other time.

Fungi among Shrubs, &c.—Specimens of fungi from Cirencester were identified as *Coprinus comatus*, Fr., Such fungi are often introduced with town refuse and are best dug up and removed. The soil should receive a good dressing of lime.

Diseased Raspberries.—Specimens of raspberries were found

to be infested with the mildew *Phyllactinia coryles*, Karst. The fungus first appears on the leaves, but subsequently renders the fruit useless. All fallen leaves should be collected and burned. The fungus grows on many different kinds of wild and cultivated plants, and there is the chance of its passing from one plant to another.

Diseased Montbretia Tubers.—These were found to be injured by *Mystrosporium adustum*, Mass. Several closely allied species of *Mystrosporium* attack corms, bulbs, tubers, rootstocks and fleshy underground parts of plants generally, and are recognised by the blackened or scorched appearance of the part attacked. The plants in this case started to grow freely and looked well up to the end of July, after which the leaves and stems became brown and withered.

When a plant is once attacked it should be removed at once and burned, before spores are formed. The earliest symptom of the presence of the parasite is the wilting of the foliage, accompanied by blackened stains on the surface of the underground portion of the plants.

Diseased Pear Leaves.—A specimen of pear leaves from Winchester was affected with the fungus *Gymnosporangium clavariæforme*, Jacq. The spermogoniae are situated on the upper surface of the leaf, the æcidia or cluster-cups on the under surface. The teleutospore condition grows on localised portions of the branches of the common juniper, the affected parts becoming thickened and distorted. The mycelium is perennial in the tissues of the juniper. The teleutospores ooze through the bark in the form of slender orange gelatinous bodies up to half an inch in length. They germinate *in situ*, and the minute secondary spores are conveyed to pear leaves by wind, insects, &c. (see also *Journal*, May, 1908, p. 115).

English Potato Scab.—Potatoes from Ceinws (Mont.) were affected with the English scab (*Spongopora scabies*, Mass.). This fungus was in 1846 named *Tuburcinia scabies*, Berk., by Berkeley. In 1877 Fischer de Waldheim removed the fungus to the genus *Sorosporium* and it became *Sorosporium scabies*, Fisch. In 1886 Brunchurst described a destructive organism on potatoes as *Spongopora solani*, Brunch., and this species was in reality the pest previously named by Berkeley, although not recognised as such by Brunchurst. Under the circumstances

the fungus will, for some time at least, be known as *Spongospora scabies*, Mass.

It is only quite recently that this disease has been recorded as occurring in quantity and proving injurious, and no remedial measures can at present therefore be definitely suggested. It is quite clear, however, that infected tubers should not be planted.

Rust on Oats.—Specimens of oats from Cross-in-Hand (Sussex) were infested with the rust *Puccinia glumarum*, Eriks. and Henn. The rust attacks wheat, barley, oats and many wild grasses. No practical remedy is known for any of the cereal rusts. (See article on *Rust in Wheat*, *Journal*, July, 1908, p. 241).

Defective Growth.—Tomatoes from Gravesend were found to bear waxy lumps while the fruit ripened unequally. This condition is believed to be due to a lack of potash in the soil. Young cucumbers and tomatoes were found not to set properly, falling off while still young. This falling off is often due to the flowers not having been fertilised.

Specimens of swedes from Gloucester were found to be of a peculiar growth owing to the main shoot having been arrested or destroyed, and lateral shoots having taken its place. The exact cause of the failure of the main shoot, however, could not be determined.

Various Specimens.—Pea haulm from Tunbridge Wells was infested with *Erysiphe Martii*, Link, a fungus allied to, but not identical with, the European gooseberry mildew; the mildew *Podospora leucotricha*, Salm., was present on the wood of gooseberry bushes from Evesham, but whether it was the cause of the death of the shoots could not be determined with certainty; oak leaves were covered with a mildew, probably a species of *Microsphaera*, which is very abundant this season in many parts of England, but the disease will not necessarily occur again next season (see *Journal*, September, 1908, p. 440); leeks from Westbury (Wilts.) appeared to be injured by a species of *Sclerotinia* (Leaflet No. 127); leaves of a plane tree were suffering from Plane Leaf Scorch, caused by the fungus *Gloeosporium nervisequum*, Sacc., a note on which appeared in this *Journal* for July, 1907, p. 222; corn smut (Leaflet No. 92) is stated to be very troublesome in the neighbourhood of Wendover (Bucks.); potatoes from Birmingham, Hayes (Kent) and Barnstaple, were attacked by potato disease (Leaflet

No. 23); vines from Anglesey and Norwich were affected with powdery mildew (Leaflet No. 133); apple specimens from Cawston (Norfolk), Norwich and Ashby-de-la-Zouch were affected with apple scab (Leaflet No. 131), the leaves of one specimen being also spotted, probably with a species of *Phyllosticta*; apple specimens from St. Leonards-on-Sea were affected with Brown rot (Leaflet No. 86); plum leaves from Watford were attacked by silver leaf (see *Journal*, July, 1908, p. 279); cabbages from Foston (Derby) and Smethwick, turnips from Smethwick, and swedes from Saxilby (Lincs.) were attacked by Finger and Toe, or Club Root (Leaflet No. 77); potato specimens from North Huish (Devon), Barnstaple, St. Leonards-on-Sea, Rochester, Crawley, East Grinstead, Guildford, Leicester, East Dereham, Oswestry, and Wakefield were affected with ordinary potato scab (see Leaflet No. 137); and gooseberry specimens from Ringwood, Farnham, Leatherhead, Tunbridge Wells, Ipswich, Northampton, and Wickwar (Glos.) were attacked by European gooseberry mildew (Leaflet No. 32).

The Tobacco Growing (Scotland) Act, which was passed on the 1st August, 1908, provides that from a date to be fixed by Order in Council as soon as **Cultivation of Tobacco in Ireland.** Parliament has made provision for an excise duty on tobacco produced in Scotland, the Tobacco Act, 1782, or any

other Act, so far as it prohibits the growing, making or curing of tobacco in Scotland, is to be repealed. The Commissioners of Inland Revenue are authorized to make regulations prohibiting the cultivation of tobacco in Scotland and the manufacture or preparation of tobacco grown in Scotland except by persons holding a licence and on land or premises approved by the Commissioners, with a view to collecting the excise duty on the tobacco. The Commissioners may, however, permit the growth of tobacco in Scotland for experimental purposes only, subject to such special regulations and conditions as they think fit, and subject to any allowances in respect of duty as may be sanctioned by the Treasury.

As the growth of tobacco, either experimentally or otherwise will be legal in Scotland after these regulations are made,

the Board think it useful to publish the following memorandum which has been prepared by the Department of Agriculture for Ireland on the experiments conducted during the past seven years in the cultivation of tobacco in that country :—

Experiments in the growing of tobacco have been carried out under the auspices of the Irish Department of Agriculture since the year 1900. In the earlier years the experiments were for the most part conducted on small plots widely distributed and the curing of the leaf was effected under great disadvantages. The results showed, however, that tobacco could be grown and cured successfully in Ireland, and that a leaf suitable for blending in smoking mixtures could be produced.

Since the year 1904, inclusive, the experiments have been conducted on a commercial scale. This involved the provision at each experimental centre of equipment for curing and finishing the leaf, as well as the planting of a considerable area with tobacco. In 1904 tobacco was grown on 20 acres at one centre. The number of centres and the area under tobacco were subsequently increased, so that during the past year, 1907, experiments were conducted at eleven centres in the following seven counties.—Louth, Meath, Kings, Kilkenny, Wexford, Cork and Limerick ; the total area cropped being almost 100 statute acres. The work is being continued on the same scale during the current year.

Since the inauguration, in 1904, of experiments on a commercial scale, the seasons have been sufficiently varied to justify the conclusion that, as to yield, tobacco is a fairly certain crop in Ireland upon suitable soils in sheltered situations.

The experience has been that there is undoubtedly a very narrow margin of growing weather for certain varieties, but generally speaking there is little hazard from frost if proper care be taken.

Almost any good, dry, tillage soil may be made to produce tobacco, but it flourishes best in a free, open soil, well stocked with vegetable mould and plant food. The capacity of soils for holding sufficient moisture is usually a prominent factor in determining the class of tobacco they are adapted to produce. This factor is, however, of less importance in Ireland owing to the marked humidity of the climate.

Varieties.—All classes of tobacco have been produced, embracing the principal types of American and other leading tobaccos. Over fifty varieties of seed, including hybrids and Irish-saved seed, have been tested. The results of these trials are not yet decisive as to the best class of tobacco for growing in Ireland. It has been possible, however, to select, somewhat definitely, certain types of each class and to discard many varieties. So far the common class of pipe-smoking tobacco seems the safest for general growing, having regard both to production and sale. Lissard Tail, Yellow and Blue Pryor, are the best varieties of this type. Red Burley, for brown roll wrappers and bright shag cutters, is produced almost as easily as Pryor and Lissard Tail, and the crop is more remunerative. It does not, however, sell so freely.

Cigarette and pipe-cutting tobaccos were made last season with promising results. A very superior bright cutter is probably the most promising tobacco yet produced in Ireland. Coloury strains of White Burley are best for the purpose.

Two distinct varieties of Turkish, viz., Latakia and Samos, were produced commercially last season, 1907, with encouraging results. It is yet premature to judge of their exact value. The experiments will be tried more extensively in 1908.

Cigar wrapper of standard types has been produced. The cultivation of this tobacco is most difficult; a high standard of quality being demanded. The experiments seem well worth following up. Sumatra and Cuba are the most promising varieties. American Seedleaf varieties grow luxuriantly, but the produce is inherently inferior to Sumatra and Cuba. The cost of producing cigar filler in Ireland is out of proportion to its quality.

The methods of culture found most suitable for Irish conditions are briefly as follows:—

Seedbeds.—Glass-covered hotbeds of simple efficient construction are made with 18 in. or more of manure, 4 in. of fertile top soil, surfaced with pulverised, sterilised, garden loam; $\frac{1}{4}$ oz. of tested seed to be sown to every 6 x 4 ft. sash by mixing with one quart of wood ashes or fine sand. Careful attention is needed to watering, ventilation, weeding and thinning.

Preparation of the Land and Rotation of Crops.—Old pasture land should be avoided in the first year after breaking up and until found free from slugs, wire worms and leather jacket grubs. Corn stubble is to be preferred, but new meadow lea or good tillage land may be used. Autumn ploughing after well-rotted dung has been distributed broadcast is advisable. Thorough spring cultivation and cleaning is required before drilling and distributing the artificial manure which should be done just before planting.

Planting.—Should be done from the 20th May to 1st June, according to weather and variety of tobacco. The distances between plants should vary with the variety and class of tobacco grown. In general, much closer planting is practised in Ireland than in America. Only in exceptionally dry weather is watering resorted to. Soon after the plants begin to grow it is necessary to remove any suckers or laterals that may spring from the axils of the leaves. This is a peculiarly Irish phenomenon. At this time cultivation should begin and continue until the plants have covered the ground. The soil should at all times be kept mellow and free from weeds. The usual attention to suckering is required, but topping or breaking out the flower head should be somewhat delayed in Ireland, as the plant is inclined to bloom prematurely. Some varieties should not be topped at all.

Harvesting.—Occurs according to season and method from 1st August until frost. With heavy shipping, Red Burley and certain Turkish and cigar varieties, the entire plant is harvested in one operation, but with yellow cigarette tobaccos and cigar wrapper varieties the leaves are harvested separately. The peculiarities of the Irish climate have caused many minor innovations in harvesting and curing operations.

Curing.—All recognised systems of curing have been tried and a new system involving forced ventilation has been tested. Air curing, where supplemented in unfavourable weather by some simple means of heating, is a success with many types of tobacco. Curing with wood fires is a practical method where large supplies of hardwood are available and cheap. Flue curing is efficient, but expensive, on account of cost of fuel. Steam heated barns are almost ideal, but are very expensive. Forced ventilation by means of fans and air ducts has not yet been proved to have any advantage.

Grading.—The process of grading the cured tobacco varies greatly with the class of tobacco grown. Grading depends on quality, size and colour, and the number of grades may vary from two to seventy. Unskilled labour makes this operation very expensive with the finer kinds of leaf.

Packing.—The customs duties in this country have given rise to the practice of importing tobacco in an exceedingly dry condition. In America tobacco destined for this market is usually packed with the aid of expensive machinery. As the Irish experimenters could not afford very heavy outlay for this purpose, simpler methods have been devised for doing the work. In America and warmer countries the tobacco may undergo a natural sweating and ageing, which in this climate must be produced artificially. In the case of cigar tobacco, the fermentation is more difficult in Ireland.

All of these disadvantages have been practically overcome.

Marketing.—The crop of 1904 and 1905 was marketed through a Dublin tobacco broker in a manner usual with imported tobacco. In 1906 the growers, through their Association, sold direct to a Belfast manufacturer. One grower outside of the Association sold direct to a Dublin manufacturer. The 1907 crop was sold in the same way, with the exception that one grower bought several crops to supply his private factory.

The prices obtained in 1904 and 1905 were influenced somewhat by the novelty of the article. The quantity of tobacco was small, and all the Irish manufacturers considered it advisable to have some of it in stock. In 1906, however, the tobacco sold by the Irish Tobacco Growers' Association was valued by an independent broker strictly upon an American basis, that is to say, the tobacco brought prices which American tobaccos of the same kind and quality were selling at in the Liverpool market. The prices for the 1906 crop varied from 2½d. to 8½d. per lb.

The yield of dry tobacco per statute acre for the 1906 crop varied from 505 to 1,661 lb. There does not appear to be any difficulty in obtaining 1,000 lb. per acre, which may be considered an average crop. Most of the yields were about this amount. In an exceptional case in 1907 a yield of 1 ton per acre has been obtained.

The cost of production is high, being not less than £20 per statute acre. The actual cost in some cases has been at least double this sum. The cost in any given case will depend mainly on the class of tobacco grown, the nature of the equipment, the methods of culture, curing and handling, and the thoroughness with which the work is carried out.

The operations to be performed in the cultivation of tobacco can be speedily learned, though a certain horticultural skill, which is not possessed by the average farmer is required. The curing and finishing for market, however, involve a number of complicated processes demanding technical skill of a high order, which can be acquired only by men of considerable intelligence and which is not to be expected among farmers generally.

The use of lupins as a green manure is very common on the light sandy soils of Germany, and it was this crop which was so successfully used by Schultz on his farm at Lupitz where, what was afterwards known as the Lupitz method, was first practised. (See *Journal*, Vol. xii,

Lupins for Green Manuring. p. 29, April, 1905, and Vol. xiv, p. 231, July, 1907.) Lupins being a leguminous crop supply the soil, when used for green manuring, with nitrogen in an easily available form for the use of the following crop, and where poor sandy soil occurs in England they might usefully be tried. The seed should be sown in the latter half of May, 1½ to 2 bushels being drilled per acre in rows 14 to 15 inches apart. The plants should be ploughed in before the seed begins to form and must not be allowed to die down.

Sheep may be folded on the lupins if the crop is not needed as green manure. The yield of seed is from 20 to 30 bushels and of green fodder 15 to 16 tons per acre. The seed, while much used for stock-feeding in some countries, is occasionally poisonous. The blue lupin is best suited for field culture, but the yellow lupin is also occasionally grown.

Where this crop is grown for the first time, it might be desirable to use "Nitragin" for inoculating the seed so that the soil may be supplied with the proper organism. Nitragin for the blue lupin, *Lupinus Angustifolius*; or for the yellow lupin,

Lupinus luteus, can be procured from Dr. A. Kühn, Ainmillerstrasse 36, Munich, price two shillings a bottle. The name of the plant for which the inoculating material is required should be specified.

Several experiment stations in the United States have been investigating the question of the pollination of tomatoes. As far back as 1890-91 it was found at the

**POLLINATION OF
TOMATOES.**

Cornell Station that the amount of pollen used had an important influence on the form and size of the fruit. More recently

these results have been confirmed at the Michigan Station, where it has also been shown that no decided advantage was gained by the cross-pollination of varieties as compared with self-pollination. Four plants of each of six varieties were used to determine the effect of using varying amounts of pollen. All the flowers on one plant of each variety were emasculated and pollinated on one side of the stigma only. These invariably produced lop-sided and small fruits. All the flowers of one plant of each variety were pollinated with from 1 to 5 pollen grains. These produced very small solid fruits, with an average weight of about 1 oz., and having no seeds or but one or two. All the flowers on one plant of each variety were pollinated with a large amount of pollen, spread all over the stigma. These produced fruits that were smoother and heavier than those produced from flowers that received but a small amount of pollen. The conclusions deduced from these experiments are that when pollen falls on one side of the stigma only, a one-sided tomato always results, and the larger the stigma the greater the irregularity. The amount of pollen applied determines to a great extent the size and smoothness of the tomato, but after applying a certain amount no further increase can be obtained. The small, irregular tomatoes grown under glass are caused largely by insufficient pollination.

With a view to throwing some light on the relative value of cross and self-pollination the blossoms of four plants of each variety were self-pollinated, and the blossoms of eight plants of each variety were cross-pollinated with two other varieties. All set fruit equally well. The 265 fruits produced from self-pollination had an average weight of 77.3 grams. The 534

fruits produced from cross-pollination on all six varieties had an average weight of 79.1 grams. There was, therefore, practically no gain in the total number of cross-pollinated fruits, but a slight gain in weight. Although it does not appear necessary to raise several varieties for the purpose of cross-pollination, there is no harm in alternating such varieties as are grown, and in some cases a possible benefit, such as a slight increase in weight, may be obtained. All the experiments, however, show that the setting of a good crop of smooth, heavy fruit depends largely on the care taken in distributing the pollen. (*U.S. Farmers Bulletin, No. 317.*)

The Irish Department of Agriculture have issued some information as to the method of marketing several of the commoner wild fruits.

Marketing Wild Fruits.

Blackberries.—Blackberries should be gathered when they have a blue-black bloom; red, unripe berries spoil the flavour of the remainder, and do not ripen with storage, while "dead-black," over-ripe fruit will not bear carriage by cart or train, and is generally mashed and often mouldy on delivery. When blackberries can be delivered not later than 9 A.M. and within twenty-four hours from the time of gathering, they may be marketed in chip baskets of 1 gallon capacity. Fruit marketed in this way is usually consigned to salesmen. The method is most likely to succeed in the early part of the season. It is advisable to use the cardboard covers made for these baskets; the cover not only protects the fruit from dirt and pilferage, but serves for use as an address label; the covers should be fastened to the baskets by string; the most secure method is to lace them to the rim of the basket, but they are generally tied on. It is also advisable when packing soft fruits such as blackberries to place a piece of grease-proof paper in the bottom of each basket, as it protects the fruit from damage and prevents waste. Suitable grease-proof paper can be bought for about 6s. per ream; one ream will suffice for 3,840 baskets. When fruit is to be forwarded in baskets, reliable pickers only should be employed, the greatest cleanliness observed, and the fruit left in the baskets

as picked, so that it may be damaged as little as possible by handling.

Bilberries.—There is a large demand for bilberries or whortleberries, especially in Lancashire and Yorkshire, where the demand usually exceeds the supply. They should be picked when of a rich blue-black colour, with the bloom on the berries at its best. This is usually in July and early in August. The fruit should be sent to market in 1 gallon chip baskets, as recommended for blackberries.

Crab Apples.—The principal demand for this fruit comes from manufacturers of jelly, who require the fruit unripe. "Crabs" should be packed in 4 or 5 bushel sacks. A custom prevails of filling the sacks to their utmost capacity, and lacing their mouths; this should not be practised, as when sacks are thus completely filled and laced a grip is not provided as is the case when the sack is tied at the mouth, hence laced sacks are thrown and pitched about in handling, and the contents are bruised and thus rendered less valuable for making jelly.

Sloes.—This fruit is ready for picking when it has a full rich bloom. On no account should unripe green sloes be picked. The best package, both for pulling and transport, is a 2-gallon chip basket. Sloes are not so perishable as blackberries and bilberries; they may, therefore, be forwarded by goods train unless ordered otherwise by the buyer.

The Board have received, through the Foreign Office, the following report on the fruit industry in Colorado, which has been prepared by Mr. Thos. Erskine,
The Colorado Fruit Industry. His Majesty's Acting Consul-General at Chicago :—

For the last few years Colorado has been coming to the front as a fruit-producing State. Its principal valleys both on the eastern and western slopes of the Rocky Mountains, together with the tributary valleys, all of which are irrigated by the streams which run through them, offer favourable conditions for the production of apples, pears, peaches, plums, cherries and small fruit, and all these fruits are produced in great abundance and of excellent quality.

On the western slope of the Rocky Mountains, principally

in Mesa, Delta and Montrose counties, apples, peaches and pears are the staple fruits grown. On the eastern slope of the Rockies, in Fremont, Otero, Larimer, Boulder and Weld counties, peaches and apples are also grown as well as small fruit ; the country around Loveland, in Larimer County, is noted for its superior raspberries and blackberries, and the Rockyford district has established a well-earned reputation for the excellence of its cantaloupes.

All these fruits are grown at an elevation of from 4,000 to 6,000 feet. At any greater elevation satisfactory results are not to be obtained regularly. The climate between the two elevations above-named appears to be pre-eminently suitable for the production of apples, peaches and pears in their finest condition, both with regard to quality and size. The abundance of bright sunshine accompanied by cool nights give a richness and delicacy of flavour to the peaches which do not seem to be excelled elsewhere. Consequently the district around Palisades, in Mesa County, is considered the best in the whole State for the production of this soft fruit. This coupled with the fact that it is so sheltered by the surrounding mountains, that killing frosts in the spring of the year are almost unknown, has given the land a very great value, and raw unimproved land with suitable water right sells to-day at from £40 to £60 per acre, whilst the price of a full bearing peach orchard is £300 or over per acre.

The district around Grand Junction is noted for the excellence of its apples and pears ; and the latter varieties of apples, such as the Jonathan, Winesaps, York Imperials, Ben Davis, &c., are much sought after and more eagerly bought than the same varieties of apples grown in other States. The prices paid for Colorado apples and pears are also much higher than is obtained for the same varieties in other districts.

Full bearing orchards are sold for from £160 to £240 per acre. The reputation and high price of Colorado fruit has become widely known, principally through the businesslike action of the fruit growers themselves. Formerly fruit dealers from the eastern cities and commission men used to buy the crops from the individual fruit grower, and the manner in which one fruit grower was played against the other always had a tendency to keep the prices very low. The fruit dealers

had things almost all their own way. The fruit growers a few years ago decided to co-operate, and in every fruit-growing district of any note fruit-growers' associations have been formed, and run on so businesslike a basis that not only does the fruit grower get the highest prices for his productions in consequence of all selling their fruit through these associations, whereby undue competition has been stopped, but the shareholders of such associations, who are the fruit growers themselves, have been year by year getting very handsome dividends. The most serious thing the fruit grower has to contend with is the spring frosts, which in some years are very destructive. Last year, 1907, these frosts were responsible for the destruction of 50 per cent. of the crop, except in the Palisades district. The prices, however, obtained, more than compensated the grower for his loss. Frosts have again occurred during the present spring which have been more serious than last year and which will reduce the pear crop by at least 50 per cent. and the apple crop by about 75 per cent. There were severe frosts from the 26th to the 28th of April, inclusive, and again on the 2nd and 3rd of May. The worst occurred on the night of the 27th, when the thermometer showed 12 degrees of frost. This meant almost total destruction of the fruit in those orchards where the necessary precautions were not taken. The precautions consist of an endeavour to raise artificially the temperature about the trees. This is done by what is termed smudging.* In a crude manner stable manure is placed in numerous piles throughout the orchard and ignited, and the warm heavy smoke thus formed envelopes the trees, and if the frost is not more than 4 to 6 degrees this is sufficient to save the crop. Should, however, the thermometer sink lower than this it has been found necessary to adopt a different method to secure the desired results. This during the past season has been done on a few occasions by the burning of crude oil. This crude oil comes from the Florence Field in Fremont County, and can be delivered in carload lots at Grand Junction for about 2d. or 2½d. per gallon. Sheet iron pots are used having a capacity of over a gallon, with a series of perforated holes around their rim, and an adjustable cover which makes

* An article on "The Prevention of Damage to Fruit by Frost" appeared in this *Journal*, April, 1907, Vol. xiv, p. 23.

the opening at the top larger or smaller at pleasure. About a gallon of crude oil is placed in these receptacles and lighted when the thermometer drops to danger point. If the frost is very severe the top is taken off completely, the combustion in that case being more rapid and the temperature more quickly raised. Experiments have shown that by aid of these pots burning crude oil, the temperature can be raised from 8 to 12 degrees, and in those orchards where this system was used during the late frost the crop has been entirely saved. One hundred such pots are used for the acre, fifty being lighted at one time. When the contents are consumed of the first fifty, then should the frost continue, the second fifty are lighted, the consumption of oil thus being regulated to the severity of the frost. It has been proved beyond doubt that by this system of smudging the complete crop can be saved even when the thermometer sinks as low a 18° or 20° F. Unfortunately where apples and pears and the hard stone fruits are grown the smudging, if done at all, is done principally by the more primitive method above mentioned.

The small fruit, such as raspberries, blackberries and strawberries promise well, and doubtless will be a full crop. Apples and pears grown in Colorado supply not only the local market, but the best quality are sent to the large eastern cities as well as to San Francisco and Los Angeles. Consignments have been sent to England and when properly packed have arrived in fine condition and have been pronounced most excellent.

The United States Department of Agriculture draws attention* to some experimental trials of a lime-sulphur wash for the prevention of fungus diseases, the **Lime-Sulphur Wash as a Fungicide.** results of which are regarded as exceedingly encouraging, though the wash has not as yet been sufficiently tested to enable it to be definitely recommended. This wash has previously been used against San José Scale and other insects of that type (*Journal*, November, 1906, Vol. xii, p. 497), but it has now given satisfactory results against several fungus disease of the apple and peach, and it is likely to prove of special

* Circular No. 1, Bureau of Plant Industry.

value in regard to the latter plant as there is practically no known fungicide which can be used on peach foliage without risk of injurious results. The mixture is composed of 10 lb. of flowers of sulphur and 15 lb. of fresh stone lime to 50 gallons of water. The lime should be put in a 50-gallon tub and 2 to 3 gallons of boiling water poured over it; the sulphur should be immediately added and another pailful of hot water. The heat from the slaking lime will cause the mixture to boil violently for several minutes. Some stirring is necessary and more water should be added if it gets too thick to stir. A piece of sacking may be thrown over the tub to keep in the heat. The boiling will continue for 20 to 30 minutes, and when it ceases cold water should be added to make up the mixture to 50 gallons, the whole being thoroughly stirred and then strained through a sieve. All the sulphur should be carefully worked through the meshes.

This wash gave very satisfactory results against brown rot of the peach, peach scab and bitter rot of apple without injuring the foliage, and it also appeared to prevent some other diseases. It is also suggested that it would, at the same time, have considerable value as an insecticide, and that it could be used to replace Bordeaux mixture as a preventive of apple scab where injury to the fruit or foliage was to be feared.

An article was published in this *Journal* in April last, in which information was given as to the systems for the insurance of live stock which prevailed in Holland,

Insurance of Live Stock in Denmark and Norway. Belgium, France, Switzerland, Germany and Sweden, and the Board have now received, through the Foreign Office, information as to the methods adopted in Denmark and Norway.

Denmark.—As regards Denmark, Mr. Consul Funch reports that generally speaking insurance is not so highly developed in Denmark as in some other European countries, though it has existed, especially as regards horses, since the year 1100. At present there are about 1,400 small mutual associations, one in each parish, for the insurance of horses, in which the losses are distributed among all the members in proportion to the amounts for which they are insured. The administration

is primitive, but has the advantage that the members are able to control each other. The narrow limits in which these associations work may, in cases of grave local epidemics, lead to serious consequences.

There are a number of companies for the insurance of stock, of which the oldest was founded in 1859. This is called the "Kreaturforsikrings Forening" (Domestic Animal Insurance Association) of Denmark, and gives compensation for losses incurred by the death of horses, cattle, sheep, swine or goats from sickness (except cattle plague). Compensation is also given for severe injuries. The amount insured in this company in 1902 was £194,000, and its reserve fund amounted to £3,300. It pays the full value of the animal, but a maximum value is imposed which in the case of cattle is fixed at £16 12s. The premium for cattle is 3 per cent. excluding, or 5 per cent. including, losses from tuberculosis. There are three other similar associations.

There is also an association known as "Kurstos," which undertakes the insurance of the whole stock on a farm. The whole live stock is insured, and if at least two animals die from disease or accident, compensation is paid for the least valuable of the first two at the rate of 40 per cent. of the value, and subsequent ones at the rate of 80 per cent. If only one animal dies only 40 per cent. is paid. All owners who have insured their stock in this way may also insure horses and cattle separately for other risks. This company is chiefly patronised by estate owners and large farmers, and the amount it had insured in 1906 was £1,346,000, together with special insurances to the amount of £526,000. The expenses of administration in this company are very low, being only at the rate of about one penny for every £5 insured. The number of members was 1,691.

In 1901 another company known as "Pan" was established at Copenhagen under the patronage of a number of leading farmers, Members of Parliament and other prominent persons. This company insures all classes of animals and also against several special risks. It also undertakes the re-insurance of the small local mutual associations mentioned above. Three-quarters of the profit is allotted as a bonus to the insured. The amount insured in 1904 was £44,000.

Besides the above companies some few local insurance associations exist for the insurance of stallions and bulls for breeding purposes. The first receive no subvention from the State, but the associations for the insurance of bulls receive small grants. About one-half the total number of horses, one-sixth of the cattle and one-thirtieth of the pigs are insured in Denmark.

Norway.—A memorandum forwarded by Sir Arthur Herbert, K.C.V.O., H.M. Minister at Christiana, states that the insurance of live stock in Norway is purely voluntary ; but, judging from the large number of private societies that have been formed for the purpose of mutual insurance, it would appear that the principle finds acceptance among the farmers.

One or two of these societies carry on business all over the country, but the others, between 100 and 200 in number, are local. Some of these insure only horses, others only cattle, and others again both horses and cattle. Some societies will only insure the whole farm stock, others single animals ; some insure against loss by illness or death, others only against death or necessary slaughter ; some compensate for the whole of the loss that has been sustained, others for only part of it.

The authorities appear to have originally entertained some doubt as to the advisability of promoting the institution of small local societies as they believed that the risks would not be so great and that the administration would be simplified if the societies covered larger districts. Experience has, however, proved that under the conditions prevailing in Norway, where small and widely scattered farms are the rule, local societies based on mutual insurance among the members are those which can do most towards the general insurance of live stock.

In order to assist societies that might be formed for this purpose, the Department of Agriculture has prepared a set of model rules. The principal points suggested are :—

- (1) That each society should consist of two separate divisions, one for horses and the other for cattle, and that each division should have its own set of accounts and its own reserve fund, but both should be under the same management. The object of this is the correct and equitable adjustment of premiums.
- (2) That single animals should not be insured, but that

the whole live stock on a farm, within certain specified age limits, should be included in the insurance.

(3) That on the commencement of an insurance there be paid (besides the premium paid in advance) a registration fee, to be applied to the formation of a reserve fund for each division.

(4) That compensation be not paid in full for losses, but that the insurer take a small part of the risk himself. This is arranged by deducting 20 per cent. from the gross amount of the compensation, and is intended to ensure the careful treatment of insured animals and to keep premiums down.

The Department of Agriculture consider it inadvisable to start a mutual insurance society for less than about 50 to 100 horses and 200 to 300 cattle. They advise the limiting of the insurance to direct loss caused by the death or necessary slaughter of horses or cattle on account of illness or accident.

The society should be managed by a small committee chosen from among the members, and they should have the power to ask a higher premium from farmers who use their horses for dangerous work or whose cattle graze on very hilly ground, &c.

It is recommended that the maximum sums for which horses and cattle can be insured should be £55 and £14 respectively.

With reference to the accounts of the system of mutual agricultural insurance in France which were given in this

Journal (December, 1904, Vol. xi, p. 547, and May, 1906, Vol. xiii, p. 119), a report of the French Minister of Agriculture states that on the 1st June, 1908, there were 8,780 mutual insurance societies, with about 498,000 members, the capital insured amounting to over £29,000,000.

Of these societies 7,241 are for the insurance of cattle, 1,442 for insurance against fire (agricultural risks), 24 against hail, 4 against accidents, and 69 are re-insurance societies. The total grants received from the French Government by the societies since 1898 have amounted to £239,000.

Many of the local societies are grouped into federations, and of these in the case of cattle insurance there are 53 in 39 departments, representing 2,731 affiliated societies, and nearly

£5,000,000 value insured. More than five-sixths of the 1,442 societies for insurance against fire are federated in fourteen unions, and there are also two societies situated in Paris for the re-insurance of these federations.

The rates of wages of farm labourers in England and Wales showed a very slight rise in 1907, but in the great majority of rural districts there was no change.

**Changes in
Wages of Agricultural
Labourers in
1907.** The increases were almost all in a mid-land belt from Wales across to East Anglia.

In the following table the changes in wages shown by the returns in 1907 are given in combination with the estimated number of agricultural labourers in the rural districts affected, together with the similar figures for the nine preceding years :—

Year.	Estimated Total Number of Labourers in Districts in which the predominant rates of wages—		Computed Amount of Change compared with each Preceding Year in Weekly Cash Wages of the Labourers in Districts affected.		
	Increased.	Decreased.	Increase.	Decrease.	Net Increase (+) or Decrease (-).
1898	183,987	2,356	£ 6,227	£ 47 + £ 1,180
1899	163,960	208	5,438	4 + 5,434
1900	230,635	—	8,150	— + 8,150
1901	127,565	10,469	3,559	398 + 3,161
1902	51,949	41,705	1,609	1,207 + 312
1903	51,095	24,953	1,449	893 + 556
1904	23,779	9,569	1,032	451 + 581
1905	6,659	12,438	252	442 - 190
1906	14,758	8,744	704	322 + 382
1907	14,971	3,439	479	103 + 376

The figures show that in the period 1898-1901 there was a decided upward movement in agricultural wages. In the following years (1902-4), and in 1906-7, the upward movement was much less marked, while in 1905 there was a slight fall.

The estimated number of agricultural labourers in districts where wages were reported as unaltered in 1907 was 407,544, while the number in districts where wages were reported to have changed was 18,410. Of these 14,971 were in districts where wages were raised, and 3,439 in districts where wages were reduced.

The estimated net increase in 1907, in the districts in which changes were reported, amounted to £376 per week in the wages of those affected, compared with an increase of £382 in 1906.

Scotland.—Information as to the rates of wages agreed upon at hiring fairs in Scotland was obtained by the Department from a correspondent who made special inquiries on the subject.

The correspondent reported that at the hirings held in 1907 wages of male farm servants on the whole remained substantially the same as in 1906, with an upward tendency in the northern counties, particularly north of Inverness-shire. In a few cases especially capable servants remaining in their old places obtained slight advances, amounting to about 10s. for the half-year. On the other hand, at the autumn hirings a larger number of men changing places had to submit to reductions, usually of 10s. or 15s. The supply of labour was generally sufficient, and at the autumn hirings there was occasionally some excess. Women remained scarce and their wages showed an upward tendency.

During the greater part of the *first* week of September the weather was extremely wet and unsettled, and thunderstorms were experienced in many parts of the country;

Notes on the Weather and the Crops. but by the end of the week fair weather was general over nearly the whole of England. Temperature was considerably below the average, every district in Great Britain being returned as "very deficient" in warmth. Rainfall was "heavy" or "very heavy" in all parts except England N.W. More than an inch was recorded on Monday at many places in the west and north. Bright sunshine was deficient over the country generally.

In the *second* week the general conditions varied greatly in different parts of the kingdom. In the south and east it was mostly fine and bright, except for some local showers and thunderstorms towards the end of the period, while in the north and north-west it was very rainy until past the middle of the week. Temperature continued below the average, and all districts except England N.E. returned the warmth as "deficient." In several localities the thermometer fell to below freezing point. Rainfall was greatly in excess of the average in Scotland, Ireland and England N.W., and slightly in excess in England S.W., while elsewhere the fall was less than the average. The rain was both heavy and continuous in many parts of Ireland and Scotland during the earlier days of the week, and measurements of more than an inch in 24 hours were very common. The largest aggregates for the week were 4·64 in. at Glencarron, 3·48 in. at Nairn, 3·36 in. at Markree Castle, and

3·29 in. at Rothesay. During a violent thunderstorm at Canterbury on Friday afternoon (the 11th) the rainfall, accompanied by hail, was exceptionally heavy. Bright sunshine exceeded the average over the greater part of England and in the English Channel, but was deficient elsewhere.

During the *third* week the weather was almost continuously unsettled, with much cloud and frequent rain in the western and northern districts; in the east and south of England the conditions were much fairer. Temperature was above the average in Scotland and the north-east and north-west of England, but below it in England S.E. and the English Channel, while in the east, centre and south-west of England it was almost identical with the normal. Rainfall exceeded the average, except in England E., S.E. and S.W., and the English Channel; in Scotland and also in England N.W. the excess was again large. Bright sunshine was deficient over the Kingdom generally, but was rather more than the average in Scotland N., England S.E. and the English Channel.

In the *fourth* week, ending on 26th September, the weather was generally cloudy and showery, with a humid atmosphere, but the falls of rain were mostly slight or moderate. Temperature exceeded the normal, and "very unusual" warmth was recorded in Scotland N. and W. and in England N.E., and "unusual" warmth in the remaining districts of England and Scotland. Rainfall varied a good deal in different localities. In Scotland N. there was very little, but it was heavy in England N.E. and E., while elsewhere it was moderate. Bright sunshine was below the average, and was generally returned as "scanty" or "very scanty."

A correspondent in North Lancashire states that very little outdoor work has been possible during the month, and most of the grain, which is yet in the fields, has deteriorated considerably. Instances are known where the pigs have been turned into the fields, the grain not being considered worth harvesting. Potatoes, which are a very heavy crop, are seriously marked with disease. A correspondent in Berkshire states that the harvest is practically finished, but the corn which was got in in September was more or less damaged, especially barley, which is much discoloured, and has sprouted in some instances. The rains and mild weather had a good effect on the pastures and roots, which have much improved. The early potatoes are growing out where not got up in time; otherwise the crop is a good one, and free from disease. Land is in good condition for wheat sowing.

According to the reports received from the Crop Estimators of the Board on the conditions and prospects of the principal crops on 15th September, the rain that set in generally towards the end of August has been beneficial to roots and grass, while it has, on the other hand, been detrimental to the cereal crops.

September Report on Crop Prospects.

Wheat is still described as an average crop, and the yield, on the whole, has been but little affected by the ungenial weather, although complaints are numerous as to delay in harvesting and deterioration in quality. This applies also to barley and oats, which have, moreover, distinctly receded, both being classed below average, while oats are quite the worst of the principal crops. Generally—although there are numerous exceptions—cereals in Scotland have fared better than in England.

The reports on potatoes are slightly more favourable than even in August; there is unusually little disease, and the promise of a full crop is maintained. Both classes of roots have benefited by the timely rains, which, indeed, relieved the anxiety that was very generally felt in August. Mangolds would appear to be a good crop, but turnips and swedes are in many districts unsatisfactory. Roots generally seem best in Scotland, and worst in the west of England.

Grass has also been much improved by the rains, while second cuts of hay have been better than was anticipated a month ago. In various districts, however, notably in the east of Scotland, pastures have remained very bare.

Plums, on the whole, have turned out to be a fair crop, and apples seem also to be quite an average, but pears are scarce. In all districts the recent storms have knocked a considerable quantity of fruit off the trees.

The recent weather has not suited hops; and apart from the damage caused by the gales, low temperatures have checked the development of the cones. Though the promising prospects of mid-August have, therefore, not been entirely borne out, and more will be left unpicked than usual, the yield per acre is still over average.

Summarising the reports, and representing an average crop by 100, the appearance of the crops in mid-September gave prospects of a yield for Great Britain which may be represented by the following percentages:—Wheat, 100; barley, 97; oats, 95; potatoes, 105; roots, 101; grass and hay, 102.

Germany.—The report on the condition of the crops in the middle of September, published by the Imperial Statistical Bureau, states that the weather during the

previous four weeks was generally rainy with a low

Notes on Crop Prospects Abroad.

temperature, though it was fine during the last week in many districts. Consequently conditions were decidedly

unfavourable for the close of the corn harvest, and the gathering of the oats and barley was delayed and interfered with. In cold districts no small part of the oats was still unharvested. Potatoes in general have gone back since last month, though not, up to the middle of September, to an important extent. Nearly all the reports speak of disease in the tubers as threatening, or as beginning to appear, or as having already made an appearance somewhat severely. Consequently the condition is reported as less favourable in most of the German States as compared with the preceding month; in the Grand Duchy of Hesse the decline is considerable, and only in Bavaria is the position somewhat better than in August, but even there it is stated that the potatoes threaten to rot if fine weather is not experienced. As regards the yield it is considered that it should not be generally unfavourable, even if the size of the tubers is not everywhere satisfactory. The average condition is put at 2·6, the same figure as last year (1 = very good, 2 = good, 3 = medium or average).

France.—The French Ministry of Agriculture have published in the *Journal Officiel* the following estimates of the area and yield of crops:—

	1908.		1907.	
	Area.	Yield.	Area.	Yield.
Wheat	Acres.	Quarters.	Acres.	Quarters.
Mixed corn	16,094,100	37,603,600	16,246,300	45,693,400
Rye	361,800	6,628,900	356,300	6,843,300
Barley	3,082,000	6,281,900	3,063,000	6,521,100
Oats	1,794,100	4,916,400	1,760,800	5,214,000
	9,582,600	34,789,300	9,561,300	36,812,200

Italy.—According to Beerbohm's Corn Trade List (2nd October) the official estimate of this year's wheat crop is 18,325,000 qrs., against 22,675,000 qrs. last year.

Hops in Poland.—Mr. C. Clive Bayley (H.M. Consul at Warsaw) reports, 7th September, that the weather in Poland has been favourable during the last two weeks, and the hop crop is excellent in both colour and quality. The yield is expected to exceed that of last year, which was, however, not a good one. In Volhynia hops have suffered much from cold and rain.

Canada.—The official report for August issued by the Census and Statistics Office estimates the yields for the Dominion as follows: wheat, 124,690,000 bushels; oats,

269,944,000 bushels ; barley, 49,488,000 bushels. These figures represent an average of 21 bushels per acre for wheat, 34 bushels for oats and 27 bushels for barley.

Hop Harvest of Oregon and Washington.—H.M. Consul at Portland, Oregon (Mr. J. Laidlaw) reports that hop picking has commenced in that State, but opinions vary as to the probable quantity that will be harvested. Rains have improved the prospects of the crop, which was suffering from continued dry weather. It is doubtful whether all will be picked, owing to the low prices offered, but the latest estimates are that in Oregon there are about 110,000 bales (of 185 lb.) on the poles, and in Washington 20,000 bales. It is believed that for various reasons from 10 to 15 per cent. will not be picked. Since last season about 8,000 acres of hop-fields in Oregon have been ploughed up and 3,500 acres in Washington.

United States.—The United States Department of Agriculture in its report on the condition of the crops on 1st October, states that the condition of maize was 77·8 as compared with 79·4 in the preceding month. The preliminary estimate of the yield per acre of spring wheat is 13·2 bushels, and of the total yield 233,090,000 bushels as against 224,645,000 bushels in 1907. Winter wheat has been estimated at 425,940,000 bushels, so that the total wheat crop is likely to amount to 659,030,000 bushels as against 634,087,000 bushels in 1907. The preliminary returns indicate an oats crop of about 789,161,000 bushels against 754,443,000 bushels in 1907, and a barley crop of 167,242,000 bushels against 153,597,000 bushels. All these crops promise, therefore, to give a somewhat higher return than last year.

The Board of Agriculture and Fisheries have been furnished by the Board of Trade with the following report, based on about 210 returns from correspondents in Agricultural Labour various districts on the demand for in England agricultural labour in September :—

during September. Farm work in September was hindered by rain in most parts of the country, and day labourers, especially such as were employed on the corn harvest, lost time in consequence. Generally speaking, the supply of extra labour was somewhat in excess of the demand.

Northern Counties.—Employment was generally regular in *Northumberland*, *Durham*, *Cumberland*, *Westmorland* and *Lancashire*, but many day labourers lost time on account of wet weather. The supply of extra labour was quite equal to the demand, and some surplus was reported from *Cumberland*. In *Yorkshire* the corn harvest provided employment for most agricultural labourers; in several districts, however, day labourers lost two or three days through rain. A correspondent in the *Malton Union* mentions a difficulty in obtaining, locally, men for tending cattle.

Midland Counties.—In *Cheshire* and *Derbyshire* the corn harvest was much hindered by wet weather, and the employment of day labourers was consequently irregular. Similar reports come from *Nottinghamshire*, *Leicestershire*, and *Rutlandshire*. There was an ample supply of extra labour in these counties, and in *Leicestershire* the supply was said to be more than sufficient. Employment was fairly regular in *Staffordshire* and *Shropshire*. On wet days, when harvest work was interrupted, day labourers were in some cases found other work. Although the corn harvest was much interrupted by rain in *Worcestershire* employment on the whole was fairly regular on account of other work (picking hops and fruit, potato lifting, and manure carting). There was a demand in this county for more men to take charge of animals. The supply of extra labour was somewhat in excess of the demand in *Warwickshire*. Harvest work and manure carting provided fairly regular employment in *Northamptonshire*, and the supply of and demand for extra labour were generally about equal. In *Oxfordshire* and *Buckinghamshire* day labourers were

reported to be somewhat affected by the wet weather, and in certain districts the supply of this class of labour was in excess of requirements. The corn harvest, hoeing, and potato raising generally provided full and regular employment in *Hertfordshire*. There was but little time lost through rain in *Bedfordshire*; day labourers, however, were somewhat in excess of the demand in certain districts.

Eastern Counties.—In *Huntingdonshire* and *Cambridgeshire* wet weather somewhat interrupted employment and caused harvest work to be delayed. In some cases, however, autumn work was proceeded with in the meantime, and the supply of and demand for extra labour were on the whole about equal. Similar reports come from *Lincolnshire*. In *Norfolk*, *Suffolk*, and *Essex* the corn harvest, threshing, ploughing, manure carting, hedge trimming, potato raising, and hoeing offered fairly regular employment, but in many districts the supply of extra labour tended to be in excess of the demand.

Southern and South-Western Counties.—In *Kent* hop-picking provided work for a number of day labourers, while threshing, hoeing, and other work also caused a fair demand for such labour; the supply, however, was generally more than sufficient. Finishing the corn harvest, hoeing, manure carting, potato lifting, and hedge trimming caused a good and fairly regular demand for labour in *Surrey* and *Sussex*, but there was a full supply, and in several districts a surplus was reported. Similar reports came from *Hampshire* and *Berkshire*. Wet weather interrupted the employment of day labourers in *Wiltshire*, and the supply of this class of labour was generally in excess of the demand. Threshing and hoeing caused a fairly good demand for labour in *Dorset*, but work on the land was hindered by rain. Employment was fairly regular in *Somerset*, and the supply of day labourers about equal to the demand. There was generally a good demand for extra labour in *Herefordshire*, but the supply was sufficient. A scarcity of carters and stockmen was reported from the *Ledbury Union*. Some irregularity of employment is reported from *Gloucestershire* on account of wet weather. Men for permanent situations were said to be somewhat scarce. Harvest work, lifting potatoes, and trimming hedges caused a fairly good and constant demand for extra labour in *Devonshire* and *Cornwall*, but the supply was ample.

Agricultural Prospects in Egypt.—A report on the Agricultural prospects in Egypt, prepared by Mr. W. H. Cadman, B.Sc., F.C.S., of the Khedivial College at Cairo, has been forwarded by the Acting British Vice-Consul at Alexandria (Mr. C. A. Greig), and is published in the *Board of Trade Journal*, 23rd July, 1908.

Miscellaneous Notes.

Belgian Ministry of Agriculture.—The Belgian Government has recently established a Bureau of the Ministry of Agriculture, for the purpose of studying questions of a legal, economic or technical character relating to agriculture and of furnishing information on these subjects to the public. This bureau (*l'Office rural*) is to be divided into three sections, as follows:—(1) Legal and economic; (2) Agriculture and live stock; and (3) Horticultural. The first section includes the study of legal and economic questions, such as laws, commercial treaties, taxation, population, the condition of the rural population and industries connected with agriculture. The second section will undertake technical matters relating to agriculture, horticulture and live stock, and the third section will deal with horticultural education, and will supply information relating to the trade in horticultural produce. (*Bull. de l'Administration de l'Agriculture*, 1908, Vol. 1, No. 5.)

*New Zealand Flax (*Phormium tenax*)*.—With reference to the note on this plant which appeared in this *Journal*, June, 1907 (p. 166), it is stated that this natural product of New Zealand is proving of great value in that country. It is amenable to cultivation and considerable areas are being planted for the production of fibre. The New Zealand Department of Agriculture has formed experimental plantations with the view of ascertaining the best varieties to grow, and there is every prospect that

increased attention will be given to it as a farm crop. Its cultivation is simple and inexpensive, and the returns from the yield highly profitable. The fibre is exported to Europe, America and Australia, and is chiefly used for the manufacture of ropes and twine. In the year 1906-7, 29,040 tons valued at £864,280 were exported and a large quantity was manufactured locally into cordage. (*Agriculture in New Zealand, 1908.*)

Goose Breeding in Germany.—The Board have received, through the Foreign Office, a despatch from H. M. Consul-General at Hamburg (Sir Wm. Ward, C.V.O.), in which it is stated that the recent formation of an association amongst the leading goose-breeders in Germany for the purpose of developing and improving the breeding of geese has directed public attention to the fact that upon the whole the production and quality of German geese has of late years largely declined. Figures are available, showing that the number of geese in Prussia, Wurtemburg and Baden fell between 1892 and 1900, and there is reason to believe that a decrease has likewise taken place in nearly all other parts of Germany. According to the 1900 census, the total number in the Empire was 6,239,126. On the other hand, a considerable increase has taken place in the importation of geese into Germany, the total number having risen fairly steadily from 6,220,000 in 1900, to 8,984,000 in 1906, and the annual value from £872,350 to £1,485,000. The diminution in the home stock, is, therefore, not due to a lack of demand, but is considered to be attributable to a neglect of careful breeding, with the result that the birds have deteriorated in quality and have become unprofitable.

Importation of Gooseberry and Black Currant Bushes into Ireland.—The American Gooseberry Mildew and Black Currant Mite (Ireland) Order, 1908, renders it unlawful to land in Ireland any gooseberry or black currant bush brought from any place outside Ireland without a licence from the Department of Agriculture. Shipping agents in Great Britain should not accept any parcel or package containing these bushes and consigned to Ireland unless it is accompanied by a statement signed by the consignor that he has obtained such a licence.

Importation of Poultry and Cattle Foods into the United States.—The following rulings relative to foods and medicinal mixtures for stock and poultry are contained in a recent "Food Inspection Decision" issued by the United States Board of Food and Drug Inspection, Department of Agriculture :—

Poultry and cattle foods which contain poisonous weed seeds in appreciable quantities will be considered as adulterated in accordance with those provisions of the Food and Drugs Act of 30th June, 1906, forbidding the presence of poisonous or deleterious ingredients.

The department has been asked by the manufacturers of medicinal mixtures for poultry, cattle, &c., whether such mixtures may, under the law, be labelled respectively as cattle and poultry foods. It is thought, first, that the words "Cattle Food" or "Poultry Food" should apply to cattle or poultry foods which are not mixed with any condimental or medicinal substance or substances; second, that mixtures of cattle and poultry food materials, with small quantities of condiments, such as aniseed, ginger, capsicum, &c., should be labelled as "Condimental Cattle Food," or "Condimental Poultry Food"; and third, that mixtures of cattle food materials with medicinal substances, such as arsenic, sulphate of iron (copperas), &c., should not be labelled as foods, but as medicines, or remedies.

Dairy Implements for Natal.—A prominent firm of machinery merchants and importers of agricultural implements in Natal desire to receive export lists of dairy implements, &c., of British manufacture.

All communications in connection with the foregoing should be addressed to the Agent-General for Natal, 26, Victoria Street, London, S.W. (*Board of Trade Journal, 23rd July, 1908.*)

Importation of Breeding Cattle into Cuba.—A decree dated 7th July, 1908, issued by the Provisional Governor of Cuba, provides that bovine cattle, except those imported for

breeding purposes, shall be subject to a duty of \$2·25 per 100 kilos. (4s. 9d. per cwt.). Bovine cattle, under six years of age, imported for breeding purposes, and belonging to the breeds of Shorthorn, Hereford, Aberdeen-Angus, Red Polled, Galloway, Devon, Jersey, Guernsey, Ayrshire and some foreign breeds are admitted free.

Regulations for the Importation of Cattle into the Philippines.—The Board have received, through the Foreign Office, a copy of the regulations, dated 5th June, 1908, for the inspection and shipment of live stock imported into the Philippine Islands. These regulations can be inspected at the offices of the Board, 8, Whitehall Place, S.W.

Demonstration Farms in the United States.—During the past few years an important scheme of demonstration work has been conducted by the United States Department of Agriculture, with the object of showing by numerous practical examples over a large area, the advantages of improved methods of agriculture. The work was started in consequence of the depredations of the Mexican cotton-boll weevil, which threatened the entire destruction of the cotton crop in many districts. Since 1904, a grant of £15,500 has been made annually by Congress, and this was supplemented in 1907 by a grant from the General Education Board of £13,800, so that together, with some local contributions, a sum of about £33,500 was available in 1907-8. Agents have been appointed throughout Texas, southern Arkansas, Oklahoma, Louisiana, and a portion of Mississippi, and the work is also being carried on to a more limited extent in Alabama, Virginia, Carolina and Georgia. Altogether 143 agents are employed, and with this force about 12,000 demonstration farms had been established, and in addition, 20,000 farmers had agreed to co-operate and make reports on results. The term "demonstration farm" is used to designate a portion of land on a farm that is worked strictly according to instructions. This is visited by an agent once a month to see that these instructions are carried out and to give further advice if necessary. The farmers who work in co-operation also agree to cultivate their crops according to instructions, but are not visited regularly by the agents.

The effect of these field demonstrations is felt to be of the greatest value in influencing farmers to adopt those improved practices which have become absolutely necessary in order to avoid the ravages of the cotton-boll weevil, and the co-operative demonstration work has proved that by following the instructions of the Bureau of Plant Industry a good crop of cotton can be raised in the most infected districts.

Inspection of Meat for Export in Holland.—The Board have received the Dutch Decree containing the regulations under Section 5 of the Inspection of Meat for Export Law, 1907. These regulations deal with the construction of slaughter-houses, methods of slaughtering, inspection both before and after slaughter, and the marking of meat. After the 1st January, 1909, no meat from Holland should arrive in the United Kingdom without the official label declaring that the meat has been inspected for export.

Bush Apples for Cider.—The following note has been received from Mr. B. T. P. Barker, the Director of the National Fruit and Cider Institute :—

In Devon, on account of the wind-swept nature of the country, it is a common practice to grow cider apple trees as half-standards, and not as full standards. Until quite recently cider varieties were apparently not grown as bush trees; a few makers are, however, starting trial plantations with standard cider varieties in bush form, in the hope that, since these trees come into bearing much more rapidly than standard trees, they will be able soon to bring their plantations to yield sufficient for practical purposes, instead of waiting for fifteen or twenty years, as is necessary with standards. There is also at the Institute a plantation of cider varieties in bush form which appears to be doing very well, and at present there seems no reason why the fruit grown on a bush tree should not be as suitable for cider as that grown on a standard.

Export of Farm Produce from Brittany.—The British Vice-Consul at Brest draws attention to the possibility of establishing an export trade in farm produce from Brittany to the United Kingdom, via Brest and Weymouth. Some suggestions are given in his report which appears in the *Board of Trade Journal*, 27th August, 1901.

Use of Artificial Fertilisers in South Australia.—The Adelaide Correspondent of the Board of Trade (Mr. J. Creswell), has forwarded an extract from the *Advertiser* of the 4th July, relative to the use of artificial fertilisers in the State of South Australia, from which it appears that their use has had such an unqualified success that the quantity consumed has increased from 3,000 tons in 1897 to 65,000 tons in 1908 in regard to cereal cultivation alone. Thousands of acres, which a few years ago used to be looked upon as entirely valueless for wheat growers, have been converted into rich grain-producing areas by chemical manures.

Mr. W. L. Summers, the Inspector of Fertilisers, estimates that between 68,500 and 69,000 tons of commercial fertilisers were used in South Australia during the year which ended with June last. Of that quantity, at least 65,000 tons had been required for the present season's cereal crops. Mr. Summers states that the imports from Great Britain and the Continent represent a marked falling-off compared with the figures of two or three years ago, while the inter-State imports have increased. (*Board of Trade Journal*, 20th August, 1908.)

Mortality among Live Stock in Germany.—The German Agricultural Society have published (*Mitt. der Deutschen Landw. Gesellschaft*, 11th April, 1908) some figures based upon the average results from 133 farms over four years of the number of deaths occurring among the various classes of live stock, as follows in percentages:—Riding and carriage horses on estates, 1·50; riding and carriage horses on farms, 2·08; farm horses, 3·47; foals, 5·60; draught oxen, 1·28; bulls, 0·89; cows, 1·10; feeding cattle, 0·72; young cattle and calves, 10·95; sheep, 3·74; lambs, 7·55; pigs, 6·58; young and sucking pigs, 48·12; poultry, 15·54; goats, 9·26; asses, 2·51. Some similar figures for France, Germany and Denmark were given in this *Journal*, November, 1907, vol. xiv, p. 488.

Harvest Weather Forecasts.—During the four months June to September, 1907, harvest weather forecasts were sent by the Meteorological Committee to 71 persons residing in various parts of the United Kingdom. The results of a comparison between the forecasts issued and the weather actually experienced showed that 92 per cent. of the forecasts were sufficiently correct to be of practical value to the farmer; 7 per cent. were classed as partial failures, but less than 1 per cent. as total failures. In the course of the season applications were received on two occasions from a Cornish firm as to the probability of a spell of fine weather of sufficient length to enable them to secure a portion of their crops. The applications were responded to by the Office, and in each case with complete success. The opinions of the recipients with regard to the value of the forecasts may be judged by the following extracts from letters to the Office. On 21st July they wrote:—"We have now cut and secured over 60 acres of prime clover hay, and our success is due to you in a great measure. You have always been right in your forecasts." On 22nd September they again wrote:—"Thank you very much for the forecasts. You have saved us a very large amount of money by them, and anxiety also. You were never once incorrect in any forecast, and this last spell of fine weather we have secured over 70 tons of hay."

Admission of Scottish Cattle into Argentina.—The Board of Agriculture and Fisheries desire to make it known that they have received a copy of the official decree of the Argentine Republic withdrawing the restrictions imposed by the decree of the 10th February last, on the importation of cattle from Scotland into the territory of the Republic.

After the 30th September, horned cattle, sheep, goats and swine may be shipped from Scotland for the purpose of being imported into the Argentine Republic.

Destruction of Rats.—The Board of Agriculture and Fisheries are informed by the Incorporated Society for the Destruction of Vermin that their inquiries as to the damage done by rats, to which reference was made in this *Journal*, August, 1908; p. 383, have resulted in a very large number of applications for schedules for the supply of information. In consequence the expenses for printing and postage are assuming very large proportions, and the Society appeals for funds to assist them in their undertaking.

SUMMARY OF AGRICULTURAL EXPERIMENTS.

As was stated in the September issue of this *Journal*, the Board propose to give from month to month a short review or summary of the reports on the experiments and inquiries which are now annually carried on by agricultural colleges and other bodies in various parts of the country. The experiments will be grouped together as far as possible according to the subject; experiments with cereals were given last month, and in the present issue a summary is given of a large number of experiments conducted during the past two years in regard to root-crops. It is not possible within the limits of the space which can be allotted to the subject in this *Journal* to do more, as a rule, than give a brief indication of the character of the experiment and of the conclusions reached. Those who are interested in any particular investigation can refer for further details to the original publication.

The Board would be glad to receive for inclusion in this summary, copies of reports on inquiries, whether carried out by agricultural colleges, societies or private persons.

EXPERIMENTS WITH ROOT CROPS.

Manuring of Mangolds (*Journal of Roy. Agric. Soc.*, 1907).—This experiment was carried out in 1907 on a field at Woburn the soil of which is distinctly light and sandy. There were four plots, each of which received 15 tons of dung; in addition, one received 1 cwt. nitrate of soda and 1 cwt. of salt, and one received 1 cwt. and another 2 cwts. of nitrate. The crop on the plot receiving dung alone was 33 tons 7 cwts., and the additional manures produced very little more. It was considered, therefore, that "season" rather than manuring was the dominant factor.

Manuring of Mangolds (*Univ. Coll. of Wales, Aberystwyth, Dept. of Agric., Ann. Rept.*, 1906).—This experiment was carried out at two centres in 1906 with various combinations of farmyard manure and artificial fertilisers. The conclusions arrived at were (1) that mangolds could be grown profitably in that part of the country with artificial manures alone; (2) that a mixture of farmyard manure and artificials is more economical than farmyard manure alone; (3) that 20 tons seems to be a sufficient dressing of farmyard manure for mangolds; (4) that 10 tons of farmyard manure is insufficient if the dressing of artificial manures be incomplete; and (5) that a complete dressing of artificial manures amounting to 2 cwts. nitrate of soda, 4 cwts. superphosphate, and 6 cwts. kainit, together with 10 tons of farmyard manure gives the most profitable result.

Manuring of Mangolds (*Field Expts., Harper-Adams Coll.*, 1907).—The results are given of manorial trials carried out at three centres in Staffordshire, while at the College Farm in Salop, trials have been conducted to ascertain what top-dressings would prove profitable. No definite

conclusions are drawn from the results, but the experiments will be continued in future years. They showed, however, that both nitrate of soda and superphosphate could be used economically as top-dressings. The effect of salt was also tried, and a gain of $4\frac{1}{2}$ tons was obtained by a 10 cwt. dressing : the plants did well and weeds were kept down.

Manuring of Mangolds (Midland Agric. Coll., Bull. No. 8).—The trials in 1906 were supplementary to those which have been carried on since 1903. The latter had shown that the following dressing gave the best results, when applied in addition to the customary application of farmyard manure, which varied at the seven centres from 15 to 20 tons :—100 lb. sulphate of ammonia (at seeding), 130 lb. nitrate of soda (at singling), 715 lb. superphosphate, 127½ lb. sulphate of potash, and 280 lb. common salt, all applied at seeding time. The trials in 1906 were intended to show whether the amount of phosphoric acid and potash could be increased, and what was the best time to apply the two fertilisers and the salt. These trials are being repeated.

Manuring of Mangolds (Univ. Coll. of N. Wales, Bangor, Bull. 9, 1906, Bull. 8, 1907).—In 1906 experiments were made to test the effects of varying quantities of farmyard manure and nitrate of soda. Taking 20 tons of farmyard manure, 3 cwts. of superphosphate, 3 cwts. of kainit and 1 cwt. nitrate as a basis, the addition of 10 tons of dung only gave an increase of 30 cwts. of mangolds. The hot, dry summer was not favourable to large dressings of farmyard manure. An extra cwt. of nitrate of soda, however, produced an increase of 5 tons per acre when added to the plot receiving 20 tons of dung. Similar trials were made in 1907 to ascertain the effect of applying an extra dressing (1) of 10 tons of farmyard manure and (2) of nitrate of soda. The result showed that a top-dressing of 1 cwt. of nitrate of soda produced as great an increase as an extra 10 tons of dung. The additional quantity of farmyard manure could therefore have been more profitably used elsewhere, seeing that it failed to produce more roots than the nitrate of soda, which cost 12s. per acre. An extra cwt. of nitrate of soda increased the yield by more than 2 tons, but when applied with the larger quantity of farmyard manure it failed to produce any addition to the crop.

Manuring of Mangolds (Essex Education Com., Field Expts., 1906).—These experiments were chiefly intended to investigate the effect of manures upon quality, and were supplementary to some earlier experiments as to the effect of manures on yield. The maximum yield was obtained at two centres with 12 tons dung, 3 cwts. nitrate, 3 cwts. superphosphate, and 3 cwts. of salt, and at another centre the highest yield was obtained by the same combination, with 3 cwts. guano instead of superphosphate. Taking the sugar and dry matter produced per acre as indicative of feeding quality, the maximum result was obtained with the dung, nitrate and superphosphate, without the salt, the addition of the latter having a different effect at each centre, but showing a tendency on the whole to reduce the amount of sugar.

Varieties of Mangolds (Field Expts., Harper-Adams Coll., 1907).—Trials have been carried out with a number of varieties since 1904. The three highest yields in 1907 were obtained from Garton's Improved Yellow and Red Intermediate and Dickson's Eclipse Red.

Varieties of Mangolds (Univ. Coll. of Wales, Aberystwyth, Agric. Dept., Ann. Rept., 1906).—Twenty-one varieties were grown on the College Farm, and the best results were obtained from Yellow Globes. This is contrary to the opinion of farmers in the locality, who consider that globe and tankard man-

golds are only suitable for a better class soil than can be found in the district. The soil of the College Farm, however, is by no means above the average.

Varieties of Mangolds (*Essex Education Com., Field Expts., 1906*).—Three varieties were grown at three centres, and gave the following average yields :—Yellow Globe, 27 tons ; Long Red, $25\frac{1}{4}$ tons ; and Golden Tankard, $22\frac{1}{2}$ tons.

The quality, whether valued on dry matter or sugar content, was decidedly poor ; but this must be attributed to the season. Calculating the dry matter and sugar per acre, the average yield of Long Red was 3 tons dry matter and 1 ton 8 cwts. sugar ; of Yellow Globe, 2 tons 10 cwts. dry matter and 1 ton 3 cwts. sugar ; and of Golden Tankard, 2 tons 10 cwts. dry matter and 1 ton 2 cwts. sugar. It will be noticed that Yellow Globe, in virtue of its superior yield, a little more than makes up for its deficiency in quality with respect to Golden Tankard.

Composition of Root Crops (*Cambridge Univ. Dept. of Agric., Guide to Expts., 1907*).—Experiments are in progress with a view to the improvement of root crops, and the results are given of (1) the composition and weight of 196 individual Golden Globe mangolds ; (2) the average yield and composition of some leading types of mangolds grown on the University Farm in the five years 1902–1906 ; (3) composition of types of mangolds grown in 1902, 1903, and 1904 at four stations in Norfolk ; (4) composition of three leading types of mangolds grown in 1902–1905 at various centres ; (5) composition of French and German mangolds grown at the University Farm in 1905 ; (6) effect of manures on the composition of mangolds in 1905 ; (7) percentage composition of four varieties of swedes grown at various centres in 1903 and 1904 ; (8) composition of two varieties of swedes grown at the University Farm from seed procured from various parts of England ; (9) composition of white turnips and kohl-rabi grown in 1904.

The method adopted with a view to the improvement of mangolds involves two stages. First, all the best-known varieties are grown, and the yield per acre ascertained ; samples are then taken and analysed with a view of determining which variety is the most profitable—*i.e.*, gives the most food per acre. So far, Long Red has come to the front on soils which are deep and good enough to grow it to perfection. For general purposes, on soil not suited to the Long Red variety, the yellow fleshed Tankards or Globes appear to be the best mangolds.

Having ascertained the qualities of existing types, the second stage of the work of improvement begins, and a few roots, which are shown by analysis to contain the largest percentage of food materials, are saved for growing seed. Small plots of both mangolds and swedes were grown in 1904 from seed so selected, and a second selection was made from these. Seed was grown from these selected roots, and a field crop obtained from this seed in 1906, the seed from each root being kept quite separate. Every individual root of this crop has been sampled and analysed, and about 70 selected roots are now being grown on for seed.

Feeding Value of Mangolds (*Cambridge Univ., Dept. of Agric., Guide to Expts., 1907*).—In connection with the possibility, referred to above, of breeding improved strains of mangolds, containing less water than those now cultivated, it is considered of importance to compare the information derived from laboratory examination with the results obtained by the stock-

feeder. When it has been ascertained by analysis that the Long Red mangold contains more dry matter on the average than the Yellow Globe, the question suggests itself : Is the feeding quality of the mangold in direct proportion to the percentage of dry matter which the roots contain ? If, for example, Yellow Globe mangolds contain 10 per cent. of dry matter and Long Reds 12 per cent., is a 30 ton crop of the latter worth as much to the feeder as a 36 ton crop of the former ?

To obtain some information on this question, the department has carried out nine experiments at various centres during the past four years, and the results are given in tabular form, together with some observations on each of the experiments, and a criticism of the results. It is considered undesirable to draw definite conclusions from these experiments, but the evidence on the following points is regarded as clear :—(1) Long Red mangolds are superior to Yellow Globes for the purpose of fattening full-grown cattle, where the rations used are similar to those generally employed in the Eastern Counties. This superiority is doubtless due to the higher percentage of dry matter present in the first-named variety ; (2) Yellow Globe mangolds, although containing a smaller percentage of dry matter than Long Reds are equal, or even superior, to the latter for the purposes of fattening yearling cattle, or for feeding store stock. For these purposes the dry matter of the Yellow mangold, probably because of the higher percentage of nitrogenous substance which it contains, is apparently better adapted than the dry matter of the Long Red variety.

Mangolds and Swedes; Distance Apart (Midland Agric. Coll., Bull. No. 6).—These trials were intended to show whether a variation in the distance of the plants apart would make any alteration in the yield or quality of the crop. In ordinary farm practice, it is customary to sow root-crops in drills 24 inches apart on the flat, and 27 inches apart where the soil is thrown into ridges. At the same time a common view prevails, based on competitions, which favours the cultivation of roots at narrower intervals. With regard to distance between the plants in the rows, custom is not quite so definite, but varies within a few inches above or below one foot. The more space given to each plant, the larger the growth, but this increased size is often obtained at the expense of quality, as it is an acknowledged fact that small and medium sized roots of the same variety have a greater feeding value than big ones. The plants must also be so arranged that horse-hoeing can be carried out.

The trials confirmed these views as regards size of roots and quality, but the total yield did not vary uniformly with the distance apart. All things considered it appeared from these trials that mangolds at intermediate distances, approaching 24 in. x 12 in., are to be recommended.

Manuring of Swedes (Univ. Coll. of Wales, Aberystwyth, Agric. Dept., Ann. Rept., 1906).—Experiments were conducted at two centres, and the results are given in detail. These trials are being continued.

Manuring of Swedes (Field Expts., Harper-Adams Coll., 1907).—Trials were conducted at two centres in Staffordshire. At the College Farm, a comparison was made between certain nitrogenous manures, but the differences shown were unimportant. A purchased compound manure has been compared for several years with home-made mixtures. As the result of five years' trials, it has been found that the average cost for manures per ton of roots was 2s. 7½d. in the case of the purchased

compound manure, and 1s. 3d. per ton for home-made mixtures. In 1907 the comparison was based on money value, a similar sum being spent on both. The home-made mixture gave three tons of roots more than the purchased manure.

Manuring of Swedes (Cumb. and Westmorland Farm School, 11th Report, 1907).—Four plots were treated at Newton Rigg with various artificials costing 29s. per acre in each case. The best result was obtained from $4\frac{1}{4}$ cwts. kainit and $6\frac{1}{4}$ cwts. of basic slag. Three plots were treated with eight loads of dung with various artificials, and $\frac{1}{2}$ cwt. nitrate of soda, 1 cwt. kainit, and 3 cwts. superphosphate gave the best result.

Manuring of Swedes (Midland Agric. Coll., Bull. 5).—Six trials are reported with farmyard manure and various combinations of artificial manures. There was very little difference in the profit per acre from 15 tons or 10 tons of farmyard manure or 10 tons of farmyard manure with a small dressing of artificials, and after charging 3s. 6d. per ton for dung the value of the increase over the unmanured plot was insignificant. The best result was obtained from a dressing of 191 lb. nitrate of soda, 233 lb. superphosphate, and 62 lb. sulphate of potash per acre.

Manuring of Swedes (Univ. Coll. Reading, Results of Expts., 1907).—Sixteen plots of one-eighth of an acre each were laid out to show the effects of different manurial treatment. Another plot was used to compare a bought manure with home-mixed manure (1) having the same analytical composition, and (2) costing the same sum. The commercial manure costing £6 10s. per ton gave slightly less return than an ordinary mixture costing £3 per ton.

Manuring of Swedes (Armstrong College, Newcastle, Bull. No. 5, 1907).—Experiments on the manuring of swedes were conducted at five centres in Durham during 1906, but the crops at two centres were not satisfactory. At the remaining centres the results varied, and it is not considered advisable to draw conclusions from them as to the most suitable dressing of artificials to be used with dung.

Manuring of Swedes (Univ. Coll. of N. Wales, Bangor, Bull. VIII, 1907).—An experiment was arranged to compare the effects of calcium cyanamide with nitrate of soda and sulphate of ammonia as a manure for swedes. Four plots received superphosphate and kainit at the rate of 392 lb. per acre each, and three plots received in addition 133 lb. cyanamide, 84 lb. sulphate of ammonia and 112 lb. nitrate of soda respectively. The plot receiving superphosphate and kainit alone gave a somewhat better result than the plots receiving nitrogen.

Manuring of Swedes (Beds. C. C. Report on Demonstration Plots, 1907).—Eleven plots were tested with different combinations of fertilisers. The complete dressings produced the heaviest crops, but were not the most profitable when the cost of the manure was deducted. The largest increase at the lowest cost was obtained from $\frac{1}{2}$ cwt. sulphate of ammonia and 3 cwts. superphosphate.

Varieties of Swedes (Beds. C. C. Rept. on Demonstration Plots, 1907).—Seven varieties were tested, but there was very little difference in the yield of the five varieties of the purple top type. Two bronze top varieties gave decidedly lower yields.

Varieties of Swedes (Field Expts., Harper-Adams Coll., 1907).—Trials have been carried out with a number of varieties since 1904. The three

highest yields in 1907 were obtained from Garton's Monarch, Garton's Victory, and Dickson's Select Green Top.

Varieties of Swedes (Univ. Coll. of Wales, Aberystwyth, Agric. Dept. Ann. Rept., 1906).—Twenty varieties were grown on the College Farm, and the three highest yields were obtained from Garton's Model, Garton's Superlative, and Carter's Elephant.

Manuring of Turnips (Aberdeen Coll. of Agric., Bull. No. 8.)—In the Aberdeen district cattle-feeding is of the greatest importance, and turnips are a staple food. From inquiries made it was found that there is a widespread, but by no means universal opinion, that slag-manured turnips are not of such good feeding quality as those manured with other fertilisers. It was stated, for instance, that turnips manured with slag caused animals to scour, that they caused the dung to be dark in colour, and that animals fed on such turnips did not thrive well. On the other hand, a few advocates of slag maintained that bulbs grown with slag were sounder than those grown with acid manures, and that animals thrrove better on them. In order to test this point experiments were undertaken in 1904 and 1905, in which cattle were fed on turnips manured with superphosphate and basic slag respectively. Twenty cattle were used for the experiment. In no case in either year did any of the cattle in the lot fed with slag-manured turnips scour or exhibit any digestive or other trouble which could be ascribed to the food. There was no difference in the dung, while the increases made by the two lots were practically equal. It is therefore considered that turnips grown with basic slag are of quite as good feeding quality as those manured with superphosphate.

Varieties of Turnips (Univ. Coll. of Wales, Aberystwyth, Agric. Dept. Ann. Report, 1906).—Thirteen varieties of turnips were grown, and the three-heaviest yields were obtained from Carter's Purple-top Mammoth, Dickson's Hardy Green Globe, and Sutton's Imperial.

Growth of Sugar Beet (Univ. Coll. Reading, Bull. 2, 1907).—Experiments in the growth of sugar beet were carried out at six centres in Bucks in 1906 with the Kleinwanzleben and the Improved White varieties. The yield of roots varied from $12\frac{1}{2}$ to $24\frac{1}{2}$ tons per acre, the average of 10 plots ($\frac{1}{4}$ acre) being about 18 tons; the Kleinwanzleben variety gave in each case a smaller yield than the Improved White, but was better as regards sugar content, which varied from 16 to 18 per cent.

Growth of Sugar Beet (Univ. Coll. of N. Wales, Bangor, Bull. No. 7, 1906).—Sugar beet was grown at four centres in Carnarvonshire in 1906, and the yields varied from 14 to nearly 17 tons per acre, with a sugar content of from 14 to 18 per cent. The plots were manured with 3 cwt.s. superphosphate, 4 cwt.s. kainit, and $1\frac{1}{2}$ cwt.s. of nitrate of soda, the plants were left about 8 in. from one another in the rows which were 18 in. apart.

Cultivation of Sugar Beet (Midland Agric. Coll., Bull. No. 7).—These trials were arranged at a number of centres in Lincolnshire to test the suitability of the soil and climate to the growth of the sugar beet. The results showed that the variety Kleinwanzleben (original) gave the heaviest yield, the best shaped roots, the greatest weight of sugar, and showed the least tendency to run to seed. With liberal manuring, over 20 tons per acre may be grown, while under varied conditions of manuring, cultivation and sowing, an average yield of $16\frac{1}{2}$ tons was obtained. Autumn cultivation and autumn manuring are necessary if well-shaped roots are to be obtained, and warp soils and deep strong loams are most suitable. The best yield, consistent

with convenience of cultivation, is to be obtained by growing in rows on the flat 15 to 18 in. apart. This is better than growing on ridges. The analyses showed that the sugar content of the beet grown on medium to strong loam was high, but that of beet grown in "carr" (peaty) land was, in some cases, abnormally low.

Growth of Sugar Beet (Essex Education Committee, Field Expts., 1906).

—The experiments made in the previous year were continued at one centre. The average yield of four varieties was 22 '3 tons as compared with 20 tons in 1905; but the percentage of sugar in the beet was only 14 '9 compared with 14 '3. This loss was to some extent compensated for by the larger yield, and the total sugar averaged 3 tons 6½ cwts. compared with 3 tons 9½ cwts. in 1905. Cooper's Selected, Kleinwanzleben and Vilmorin's Improved again proved the best sugar yielders.

Growth of Sugar Beet (Cambridge Univ. Dept. of Agric., Guide to Expts., 1907).—Several experiments were carried out in 1905 and 1906. (1) Four varieties were tested on light soil in Hunts in 1905. Vilmorin's Improved yielded 20 tons per acre with 18 per cent. of sugar, and Kleinwanzleben 18 tons with 18 per cent. of sugar. (2) A similar experiment was made on a stiff loam soil in Hunts, but the crop did not start well owing to the dry season, and never recovered. On this soil great difficulty was experienced in harvesting, the larger roots having to be dug out with draining spades. It would obviously be impossible to grow ordinary sugar beet with any chance of profit on a clay soil. (3) In 1906 Vilmorin's Improved White and Kleinwanzleben were sown and cultivated in the same way as a mangold crop on a peaty soil at Ramsey, Hunts, and on silt at Outwell, Norfolk. A yield of 23 tons was obtained on the peaty soil, but the quality was very poor. Peaty soils are regarded as unfit for beet growing on the Continent. The quality was satisfactory on the silt. (4) Experiments were carried out in 1905 and 1906 at Histon, Cambs., to test the effect of various manures on the yield and composition of sugar beet. On this rich soil the manures produced no great effect either on weight or composition in 1905; but in 1906 the omission of sulphate of ammonia from the complete mixture appeared to produce a marked effect on the yield. When this was replaced by nitrate of soda the plants were later in ripening, and the quality of the beet was depreciated.

OFFICIAL CIRCULARS AND NOTICES.

The following memorandum, which is being issued as a leaflet, has been prepared chiefly for the information of the local authorities concerned in the administration of the Small Holdings Acts, but it will also be useful to applicants for small holdings and other persons interested in the Acts.

A "small holding" for the purposes of the Small Holdings Acts, means an agricultural holding which is more than one acre and not more than fifty acres in extent. Its area may, however, exceed fifty acres, if its annual value for the purposes of income tax is not more than £50.

The Administration of the Small Holdings Acts.

The local authorities directly responsible for the provision of small holdings under the Acts are the County Councils and the Councils of County Boroughs.

Appointment of Small Holdings and Allotments Committee.—The first step to be taken by a Council to bring the Act into operation is the appointment of a Small Holdings and Allotments Committee, which may include non-members of the Council.

The Council may delegate all their powers under the Acts to the Committee, except the power of raising a rate or of borrowing money, and with a view to avoiding unnecessary delay, it is desirable that full powers should be delegated and that the Committee should be authorised to conduct all correspondence relating to the Acts and to carry out inquiries, &c., without having to refer each point to the Council.

In the case of a County Borough, the members of the Committee might conveniently be appointed allotment managers under the Allotments Acts.

Applications.—After Councils have made known the provisions of the Acts throughout the county or borough by advertisement, &c., applications should be invited, and forms of application supplied, which should contain inquiries as to the experience of the applicant, and whether he or she has sufficient capital to work the holding with a reasonable prospect of success.

Applicants should also be asked to state in the form of application how much land they desire, and whether arable or grass, whether they desire to purchase or hire the land, whether they require a house or buildings, whether they desire any particular land if it can be obtained for them, and whether they are occupying any land at the time of making application.

Rules.—Rules for the sale and letting of small holdings are required to be made by Councils. These rules must be confirmed by the Board of Agriculture and Fisheries, who have issued model rules for the information and guidance of Councils.

Inquiries as to Suitability of Applicants.—On the receipt of applications for land, a Council should satisfy themselves as to the qualifications and suitability of the applicants by means of inquiries at which they can be interviewed personally. For this purpose the best course will be to appoint sub-committees, consisting partly of members of the Small Holdings Committee, and partly of members of the minor local authorities and other suitable persons, for each parish or other convenient area from which applications have been received.

In dealing with the applications it will be necessary to consider the provisions contained in the Act of 1892, which require that "applicants must themselves cultivate the holdings." It seems clear that these provisions are intended to be read with section seven of the Act of 1892, which requires the Council to make rules guarding against any small holding being held by a person who is unable to cultivate it properly, the object being to secure that the small holder shall personally apply the requisite skill and ability to the cultivation of the holding.

The words should not be interpreted in a narrow sense, and persons who require land as an adjunct to their present occupations should not be refused on that account, nor should their applications be given a secondary place as compared with those of men who propose to devote their whole time to their holdings. In this connection it should be remembered that section twenty of the Act of 1892 defines "cultivation" to include the use of land for any purpose of husbandry, inclusive of the keeping or breeding of live stock, poultry, or bees, and the growth of fruit, vegetables, and the like. The provision that the small holders must themselves cultivate their holdings does not exclude the use of hired labour to assist them in the cultivation.

Appointment of a Special Officer.—If the work of the sub-committees is to be carried out properly, it will probably be found necessary for the Council to appoint a special officer to act as their land or estate agent, and to deal with the business arising under the Acts. Such an officer should act as clerk to the Small Holdings and Allotments Committee, and he might also be responsible for attending and reporting the meetings of the local sub-committees, and for making such inquiries as the Committee might direct into the suitability of the applicants for land and the best means of meeting their demands. In addition, he could undertake the management and supervision of the small holdings, when established, and the collection of the rents, and could act

generally as the estate agent of the Council for all the land acquired by them under the Acts.

Acquisition of Land by Agreement.—When the Council are satisfied that there are suitable applicants, it will be necessary for them to consider how they should proceed to obtain the land to satisfy their demands. For this purpose a look-out should be kept for any forthcoming sales of property in the county. It may be desirable to ascertain from the local landowners whether they are willing to offer to the Council any farms which may become vacant, and inquiry might also be made as to the possibility of purchasing or hiring some of the glebe lands attached to benefices. Land may be acquired either within or without the county. In considering the question of acquiring any particular land, the Council will have to decide whether the land should be purchased or hired, and, in cases where any considerable amount will have to be spent on equipment, there are obvious advantages in the purchase rather than the hiring of land, in order to avoid the difficult question of compensation for improvements, as between the Council and the landlord, at the termination of a lease which may not be renewed, and the necessity of imposing high rents to cover the replacement, in a comparatively short period, of money spent on improvements.

It will also be necessary for the Council to decide whether they propose to acquire the land under a scheme or not. It is open to a Council to proceed without a scheme, but if this course is adopted no claim can be made by the Council for any repayment out of the Small Holdings Account towards any loss which may be incurred. If it is decided to proceed under a scheme, a contract for the purchase or hiring of the land, conditional if possible, on the approval of the scheme, should be entered into, and a report should be prepared by the Small Holdings Committee containing the following information:—

- (1) The situation and quantity of the land to be acquired and the proposed purchase price or rent.
- (2) The maximum amount to be expended on adaptation and equipment, with particulars of the work proposed, but not, in the first instance, plans or specifications.
- (3) The manner in which the land is proposed to be sub-divided.
- (4) The purchase price or rent proposed to be charged for each holding.

The report should also state whether the Council are satisfied that there are suitable applicants ready to take the land at a sufficient price or rent to recoup the Council for the outlay proposed, and an Ordnance Map, or a tracing therefrom, should be prepared showing the holdings into which the land is proposed to be divided.

The report and plan should then be sent to the Board of Agriculture and Fisheries for their provisional sanction, and when this has been given the proposed scheme must be advertised in accordance with sec. 4 of the Act of 1907. For this purpose it will be sufficient if a notice in the following form is inserted in one or more of the local newspapers circulating in the county or borough:—

Small Holdings Acts, 1892 and 1907.

Notice is hereby given that a draft scheme has been prepared by the
Council for the acquisition ^{on lease} _{by purchase} of

for small holdings. Information as to the contents of the draft scheme can be obtained from the Clerk of the Council. Any objection to the draft scheme is to be sent in writing to the Board of Agriculture and Fisheries within one week from the date of the publication of this Notice.

If no objections are received the Board will then proceed to confirm the scheme, and the Council will be able to complete the contract.

If it is desired to purchase land at a sale by auction the Council should obtain a report and valuation of the land, a copy of which should be sent to the Board. If the

report and valuation prove satisfactory, the Council might then instruct an agent to bid up to the amount of the valuation. If the land is acquired a scheme can then be prepared and submitted to the Board, who have stated that, in cases where it has not been possible to obtain their sanction before the completion of the contract, they will be ready to consider a subsequent application for their approval to the scheme.

Borrowing Powers.—A County Council or the Council of a Coun'y Borough may borrow money for the purposes of the Small Holdings Acts from the Public Works Loans Commissioners, with the sanction of the Local Government Board, at a uniform rate of $3\frac{1}{2}$ per cent., irrespective of the term of the loan. In the case of loans for the purchase of land, the term of the loan may be as long as eighty years, and the Local Government Board have stated that, as a general rule, they will be prepared to sanction the full term of eighty years. The maximum term for loans for adaptation, or for the purpose of making advances to sitting tenants, under Section 17 of the Act of 1892 (see later), or for any other purpose, except the purchase of land, is fifty years.

Repayment of Preliminary Expenses of Acquiring Land.—Section 17 of the Act of 1907, authorises the Board, subject to regulations to be made with the approval of the Treasury, to pay out of the Small Holdings Account the whole or any part of the expenses incurred by a Council in proceedings in relation to the acquisition of land. Regulations under this section have been issued, by which the Board undertake to pay the whole of the expenses which have been necessarily or reasonably so incurred, and the Board have stated that though they cannot indicate precisely what particular items of expense will be subject to repayment, the following would seem to be the most important :—

- (1) Cost of report and valuation in respect of any land the acquisition of which is under consideration by the Council (including cases where the land is not eventually acquired).
- (2) Cost of proceedings for obtaining a compulsory order.
- (3) Arbitration expenses in cases of compulsory purchase.
- (4) Valuation expenses in cases of compulsory hiring.
- (5) Conveyancing expenses.
- (6) Cost of registration of title.

The Board have drawn up the following scale of fees, which they will be prepared to recognise for reports and valuations of land, viz :—1s. an acre for the first 100 acres and 6d. an acre above that quantity, with a minimum fee of £3 3s. Travelling and out-of-pocket expenses will be allowed in addition.

If an officer of the Council is employed on any work connected with the acquisition of land for small holdings, it will be desirable that he should be paid for such work by fees or special allowance, in order to facilitate the adjustment of claims for repayment by the Board.

Losses under a Scheme.—By Section 5 (4) of the Act of 1907 the Board are empowered to pay, with the sanction of the Treasury, the whole or part of any loss which may result from the carrying out of a scheme, and a Treasury Minute, dated 31st December, 1907, has been issued which authorises the payment of one-half of any irrecoverable loss which results from the working of a scheme initiated by the local authority and approved by the Board.

Compulsory acquisition of Land.—Extensive powers of leasing land to Councils for small holdings and allotments are given by these Acts to incumbents and other limited owners, but cases will occur in which Councils will be unable to obtain suitable land for small holdings by agreement, and they must then consider whether they should not apply to the Board for an Order authorising them to acquire land compulsorily. If they decide to do so, they must select the land which they propose to acquire; and in this connection it must be remembered that no holding of fifty acres or less, no land which forms part of a park, garden or pleasure ground, or of

the home farm of a mansion house, or which is otherwise required for the amenity or convenience of a dwelling-house, and no land which has been acquired by a local authority or statutory corporation or company for a public undertaking, can be compulsorily acquired. In addition, the Council should not lose sight of the fact that they must, so far as practicable, avoid taking an undue or inconvenient quantity of land from any one owner or tenant, and that if it is proposed to acquire part only of a holding, a claim for compensation for severance may arise, which will have the effect of increasing the price or rent to be paid for the portion taken.

Having decided upon the land to be acquired, the Council must prepare an Order in the form prescribed by the Board, advertise it in the local press, and give notice to the Board and to each owner, lessee and occupier of the land proposed to be acquired. Objections, if any, to the Order must be sent to the Board within a month from the receipt of the notice. If no objections are received, the Board will then confirm the Order forthwith; but if notice has been given of objections, the Board will order a local inquiry, at which the Council and all persons interested in the land may appear and be heard. The Board, after considering the report of the person holding the inquiry, will then decide whether the Order should be confirmed or not, and whether with or without modifications. When confirmed, the Order becomes valid, and has the effect of an Act of Parliament.

The Order having been made, the amount of compensation to the various parties interested in the land remains to be settled. If no agreement can be arrived at as to the amount of compensation, the sum will be settled, in the case of purchase, by a single arbitrator, and in the case of hiring, by a valuer, appointed in either case by the Board.

The possession of land which has been hired compulsorily may be resumed by the landlord on twelve months' notice if he can prove to the satisfaction of the Board that it is required to be used for building, mining or other industrial purposes; and it is accordingly provided in the Act that the valuer, in assessing the rent to be paid by a Council for land which is hired compulsorily, shall not take into account any prospective value which might attach to the land if used for any purpose for which the landlord can resume possession. The effect of this provision is that land which has a prospective building value, but which is not yet ripe for that purpose, can in the meantime be hired by a Council at an agricultural rent.

Regulations as to the compulsory purchase and hiring of land, containing the prescribed forms for compulsory Orders, have been issued by the Board, and can be obtained either directly, or through any bookseller, from Messrs. Wyman and Sons, Limited, Fetter Lane, London, E.C., price 1*d.* per copy or post free 1*½d.*

Adaptation and Equipment.—When land has been acquired by a Council they may adapt it for small holdings by dividing and fencing it, making roads, providing water supply, drainage, &c., and they may, also, as part of the agreement for sale or letting, erect houses and buildings, or adapt existing houses or buildings. Not more than one house may be erected for occupation with any one holding. Money may be borrowed for these purposes from the Public Works Loan Commissioners at 3*½* per cent. for such term not exceeding fifty years, as may be sanctioned by the Local Government Board.

Sale or Letting of Small Holdings.—Land can only be let by a Council, except in the case of land purchased by agreement, which may, if the Council think fit, be sold on the terms referred to below. The rent of land which is let must be fixed at a sum to be sufficient to recoup the Council for the whole of their expenses in acquiring and adapting the land, together with a sufficient margin to cover tithe, repairs, management, and contingencies. Whether the sinking fund charges for the replacement of principal must be included in the rents of the holdings is a question upon which opinions differ, and Councils are using their own discretion in the matter. As a general rule it will be desirable that rates and taxes should be paid by the tenants themselves.

Terms of Sale of Small Holdings.—Land which has been purchased by agreement may be sold by a Council on the following terms :—

- (I) At least one-fifth of the agreed purchase money must be paid down upon completion of the purchase.
- (II) A sum not exceeding one-fourth of the purchase money may, if the Council think fit, remain a perpetual charge upon the holding, *i.e.*, the purchaser will pay an annual sum representing the interest on that portion of the purchase money.
- (III) The balance of the purchase money, with interest, must be paid to the Council in half-yearly instalments spread over a period not exceeding fifty years. In certain cases the repayment of instalments may be postponed for five years.

Every small holding sold by a Council will remain subject to certain conditions for twenty years from the date of the sale, and thereafter so long as any part of the purchase money remains unpaid. The main object of the conditions is to ensure that the holding will not be diverted from the purpose of agriculture. Upon a breach of the conditions the Council may resume possession of the holding.

Power to Let to Associations.—With the consent of the Board a Council may let land for Small Holdings to associations formed for the purpose of creating or promoting the creation of small holdings, and so constituted that the division of profits among the members of the association is prohibited or restricted. The Board have drawn up rules which they will require every such association to adopt, if it desires to rent land from the County Council for small holdings, and copies of these rules and other information as to the formation of associations may be obtained from the Secretary of the Agricultural Organisation Society, Dacre House, Dacre Street, London, S.W.

There are obvious advantages from the point of view of the County Council in letting land to such associations or societies, who can undertake the whole responsibility of dividing the land, selecting the tenants, managing the holdings and collecting the rents, while the tenants will be in a very favourable position for the organisation of a system of co-operative purchase of their requirements and disposal of their produce.

Assistance to Co-operative Societies and Credit Banks.—County Councils are empowered by Section 39 of the Act of 1907, to encourage and assist credit banks and other co-operative societies which have as their object, or one of their objects, the provision or the profitable working of small holdings or allotments, and they may, with the sanction of the Local Government Board, give grants, and guarantee or make advances to such societies. They may also appoint a central co-operative society such as the Agricultural Organisation Society, to be their agents for the purpose of promoting co-operation among the small holders in their county, and may make it the medium through which any financial assistance they propose to give should be dispensed to the local societies.

Loans to Sitting Tenants.—If the tenant of a small holding agrees with his landlord for the purchase of the holding, the County Council may, if they are satisfied that the title to the holding is good, that the sale is made in good faith and that the price is reasonable, advance to the tenant an amount not exceeding four-fifths of the purchase money. The tenant then becomes subject to the same conditions as are imposed in the case of a small holding provided and sold by the Council, and the terms as to repayment of the advance are the same as in that case.

The Board of Agriculture and Fisheries desire to notify that 244 cases of Wart Diseases or Black Scab in this year's potato crop had been reported to them up to 3rd October. These cases have occurred in the following counties—Shropshire, 60; Staffordshire, 57; Lancashire, 50; Warwickshire, 25; Cheshire, 30; Worcestershire and Leicestershire, 4 each; Derbyshire, 3; Merionethshire, 2; and 1 each in Perthshire, Stirlingshire, Dumfriesshire, Cumberland, Nottingham, Berkshire, Flintshire, Breconshire and Glamorgan. A few cases among field crops have been found in the counties in which the disease is most common, but in the great majority of cases, the disease has occurred in allotments or in gardens in which potatoes are constantly grown.

Enquiries made by the Board lead them to think that Wart Disease is very common in gardens in five, at least, of the above named counties. The disease has been known in certain districts for 10—15 years, and as growers have taken no steps to check its progress it is now causing serious loss. As Wart Disease may be carried from place to place in infected tubers, it is important to secure "seed" potatoes free from this disease. At the same time the greater number of cases reported would appear to be due to the cultivation of potatoes in soil previously infected, or to the use of manure containing refuse from a diseased crop, and in many instances the seed has been viewed with quite unjustifiable suspicion. It should be remembered that even in counties in which Wart Disease is common, it has not yet seriously affected field crops, and the percentage of diseased potatoes offered for "seed" must be inconsiderable.

All cases of Wart Disease must be notified to the Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W. Persons notifying the disease will receive directions as to its treatment. It is believed that under careful treatment this disease can be eradicated, but if neglected it may render the soil unfit for potato growing.

In the case of farmers who sell "seed" potatoes, notification of the disease is of especial importance, and failure to notify must be regarded as a serious offence. The Board desire to draw the attention of all "seed" growers to the provisions of an Order issued under the Destructive Insects and Pests Acts, 1877—1907, which render persons concealing Wart Disease liable to prosecution and to a penalty of £10.

In addition to the names already mentioned, Wart Disease is locally known as Cauliflower Disease, "Fungus," and Canker.

In consequence of the discovery of American Gooseberry Mildew in Shropshire the Board of Agriculture and Fisheries have made an Order which came into operation on the 10th of October, 1908, and applied to the County of Shropshire. The Order is on very similar lines to the Orders applied to other counties where American Gooseberry Mildew has appeared, of which a summary was given in this *Journal*, January, 1908, p. 624.

The Irish Department of Agriculture, in view of the fact that Black Scab in Potatoes is not known to exist in Ireland, has issued an Order making it compulsory on every person having potatoes affected with disease to

notify the fact to the Department. It also prohibits under heavy penalty the landing in Ireland of any diseased tubers.

In connection with this Order, the Irish Department suggests that seed potatoes should not be purchased from

Great Britain unless the vendors are prepared to give a guarantee that Black Scab was not known to exist on the farms on which the potatoes were grown.

Wart Disease or Black Scab of Potatoes.

The American Goose- berry Mildew (Shropshire) Order of 1908.

Black Scab in Potatoes (Ireland) Order of 1908.

REVIEW OF MARKET PRICES IN SEPTEMBER.

A. T. MATTHEWS.

The peculiar atmospheric conditions of the present season have been anything but favourable for grazing, and for many weeks the cattle coming to market have shown a marked tendency to deteriorate in quality from the butchers' point of view. Cattle have done badly at pasture, in striking contrast to last year's grazing results. Keep has been short in quantity and poor in feeding quality, and yet about the usual numbers have been marketed, with the inevitable effect of depressing prices. This has been the case almost all over England except at one or two places in the eastern counties, which are the centres, not only of exceptionally good grazing districts, but of a better system of feeding than prevails generally. There have been many complaints on the part of butchers of cattle weighing light after slaughter in comparison to appearances when alive, and in many instances the weigh-bridge, used after sale, has revealed indifferent bargains for the purchaser. It may be safely assumed, therefore, that quotations of prices derived from estimate in the usual way have frequently understated the actual price per stone.

First Week.—At Islington on the 7th supplies were about normal in numbers, both of cattle and sheep, but, largely in consequence of their prevailing unripe condition, trade for cattle was decidedly against sellers, and the best Herefords, which made 7d. per lb. on the last day of August, had to be reduced to 6½d., the same decline applying to Devons and Scots. Shorthorns and Welsh Runts, however, were still quoted at 6½d. to 6d. and 6¾d. to 6½d. respectively. If proof were required that want of condition was at least partly responsible for the low price of ox-beef, it would be found in the very small difference between the value of second quality steers and that of fat cows from London dairies. Some of the ripest and youngest of these were in fact sold at 6d. per lb., while their average was about 5½d. The trade for second quality cattle in London suffered considerably from the large arrivals of Canadian "Ranchers," which were in quite as good condition as the bulk of the English grass-fed animals and selling at 5d. to 5½d. per lb. in the Central Market.

The class of sheep supplied to London in the autumn presents a great contrast to that which comes during the spring months, when the English tegs form the bulk of those on offer. At this time of year the market is made up of heavy wether sheep of many of the coarser breeds, such as Kents, two-year-old Longwools, Irish Longwools, Lincoln half-breds, &c. Very low prices had to be accepted for many of these at the first September market. The Kents were not worth more than 6d. per lb., which was the value of Down ewes, but Irish Roscommon, which carry much more lean flesh, sold at 7½d., and this is a surprising difference of value between two breeds of white-faced Longwool sheep. Cheviots and Scotch half-breds, weighing about 64 lb., realized 8½d., and English Downs of 72 lb. 8d. per lb. Lambs, rapidly going out of season, were in small supply, a few Scotch fetching 9d. per lb.

The country markets showed little change during the week, but the tendency was generally weaker for both cattle and sheep. Shorthorn cattle sold better in the country than in London, as the following prices will show: —London, 7s. 7d. per 14 lb. stone; Ashford, 8s. 1d.; Chichester, 8s. 2d.;

Dorchester, 7s. 10d.; Bristol, 7s. 9d.; Newport, 7s. 10d.; Shrewsbury, 7s. 10d.; Denbigh, 7s. 7d.; Derby, 7s. 10d.; Leicester, 7s. 9d.; Peterborough, 8s. 3d.; Ipswich, 8s. 6d.; Norwich, 8s.; Lincoln, 7s. 6d.; Hull, 7s. 9d.; Leeds, 7s. 7d.; Wakefield, 7s. 9d.; Newcastle, 7s. 9d. These prices are given at length, as the relatively low price obtainable at the Metropolitan market is remarkable and rather uncommon, but, as already stated, it is accounted for by the keen competition of Canadian port-killed beef peculiar to the time of year and the inferior character of the home supplies.

In a less degree the same thing occurred with fat sheep. The top quotation for best Downs at London was 8d. per lb. against 9d. at Chichester, 8½d. at Derby and Norwich, and 8¼d. at Dorchester, Bristol, Shrewsbury and Ipswich. On the other hand, at Peterborough and York the same class of sheep sold at 7½d. and at Leicester 7½d. At Hereford, Newcastle, Wolverhampton and Crewe the price was the same as in London.

The carcase trade at the Central Market was much depressed, but Scotch and English beef were holding their own much better than foreign, whether port-killed, chilled or frozen. The best American chilled fell to 6d. per lb. for hind quarters, and 3½d. for fore quarters, or an average of 4½d. for the whole side for best quality, while the best Scotch longsides were worth 6½d. and English 5½d. per lb. Carcase mutton again declined in value, the finest Scotch being only saleable at 7d. per lb. and other sorts in the usual proportion. Prime veal was worth 7½d. and small pork 6d. per lb., but lamb was quoted at 7d., or no dearer than small mutton. Dutch mutton receded to 6d. per lb., but frozen was nominally unchanged.

Second Week.—The arrival of the period when the winter feeders begin to purchase stores for the Christmas markets, brought some slight relief to the pressure on the trade in butchers' cattle at Islington on the 14th by withdrawing at least a portion of a very undesirable supply. Still the condition of the animals on offer was far below the average, while the adverse effect of the heavy offerings of low-priced Canadian carcases at the Central Market was more marked than in the previous week. Consequently, although there was a somewhat better attendance of buyers, prices showed no improvement. It is possible that readers of the weekly price returns may sometimes notice a discrepancy between the live-weight quotations and those of the ordinary prices arrived at by estimate, and it may be well to remind them that the instances of the former given for London in "Notes on the Markets" are mostly taken in connection with animals weighed after sale, and in these cases the prices per cwt. depend largely on the judgment of buyers. On the day in question some Herefords, exactly similar to others nominally worth 36s. per cwt., the top quotation of the day, actually realized 39s. according to the weighbridge, and as scarcely any of the cattle from the pastures this season yield more 8 lb. stones after slaughter than 14 lb. stones live-weight, the above-mentioned instance is only one of many which prove how badly the cattle are weighing.

The quotations for fat sheep at this particular market require a word of explanation. Prices generally were lower, even including those of Cheviots and Scotch half-breds. Yet it was found necessary to quote English "Downs" ½d. per lb. dearer for the following reason:—Up to this point small wethers of 72 lb. had been considered as the "first quality" and these had been quoted the week previously at 8d. per lb., but this week, the lamb season being virtually over, and fine Hampshire tegs of 64 lb. arriving, these were

quoted at $8\frac{1}{2}d.$, as representing the best "Down" mutton, thus marking, in act, the beginning of a new season.

In the dead-meat market the peculiar character of the season is shown in the relative values of the different classes of beef. Scotland has been able to continue sending a certain number of sides to Smithfield, of the usual standard of quality, and this class has maintained its price far better than either English or port-killed beef. During the second week in September, Scotch sides were firm at $6\frac{1}{2}d.$ per lb., while the best English on offer was only fetching $5\frac{1}{2}d.$, and first quality Deptford killed, the same price, and some of the Canadian Ranch beef sold as low as $4\frac{1}{2}d.$. Home grown mutton was still declining in demand, and values for English again tended downward, the best wether carcases of about 72 lb. in weight only realizing $6\frac{1}{2}d.$ per lb. Good veal maintained its top price at $7\frac{1}{2}d.$ and small pork advanced to $6\frac{1}{2}d.$ per lb.

Third Week.—During this week there was a sudden change in the weather, several days in succession being close and warm, and when this occurs at this time of year with its greater humidity, the meat trade is always adversely affected, such conditions being worse than those of the height of summer for danger of tainting. There is no doubt that this had its effect on all markets, and that of Islington on the 21st was considerably depressed. There was no improvement in the general quality of either cattle or sheep, nor is there likely to be any in that of cattle until the season for stall-fed beasts arrives. The value of the few fairly ripe steers was maintained with difficulty, but Shorthorns were very poorly represented and so declined a further $\frac{1}{2}d.$ per lb.

Sheep were in very moderate supply, numbering only 4,620, but even these were not nearly all sold, so poor was the demand. English Down tegs from Hampshire, the choicest English mutton on offer, weighing about 64 lb., declined $4d.$ per 8 lb., and had to be quoted at $8d.$ per lb. On the other hand Scotch tegs were scarce and a few of the best made a little more money, but the Irish Roscommon declined $\frac{1}{2}d.$ and were not all sold.

There was a strong note of depression in the reporters' notes which came from nearly all the markets during the week, complaints of the condition of the animals being almost uniform. Inverness stood almost alone in reporting any animation in the trade, with an actual advance in prices for both cattle and sheep. A decline in beef was noted at Ashford, Carlisle, Crewe, Darlington, Leeds, Leicester, Peterborough, Wakefield and York. The Scotch markets, as a whole, were rather less weak than the English. Perhaps the most striking feature was the very low relative price of cattle in London. Out of 15 markets quoted by the 14-lb. stone in the official returns, Islington was the lowest of all for cattle described as Shorthorns. The top price there for this class of cattle was $7s. 3d.$, while at Ipswich it was $8s. 6d.$, at Norwich and Newcastle $8s.$, at Ashford, Chichester, Dorchester, Newport and Derby $7s. 10d.$, at Peterborough $7s. 8d.$, at Leicester, Lincoln and Wakefield $7s. 6d.$, and at Leeds $7s. 4d.$ It is evident that there must be more than one cause for such an unusual state of things, and it may be that for some reason the best cattle were retained for the local markets, added to which the second-rate animals sent to London were undersold by the very cheap Canadians.

As regards the country trade for fat sheep there is no doubt it was worse than that for cattle. It was reported lower at about 17 markets, while prices were maintained at only about half that number. The highest quotation for

Downs was from Chichester, where naturally the Sussex Down is found at its best. Here 9d. per lb. was quoted against 8½d. at Shrewsbury, 8½d. at Dorchester, Derby and Norwich, 8d. at London, Bristol, Hereford, Peterborough, Ipswich and Wolverhampton, 7½d. at Newcastle, and 7½d. at Leicester, Crewe and York. These prices are over 1d. per lb. lower than those ruling at the same period last year.

The dead-meat trade of the week showed some unimportant fluctuations. The best Scotch sides of beef still continued firm at 4s. 4d. for long and 4s. 10d. for short sides, but, with the exception of American chilled hind-quarters, all other kinds were lower by about ½d. per lb. Usually the best Deptford killed makes a trifle more money in the Central Market than English, but this week there was no difference in their value, the best quality in each case making 5½d. per lb. Canadian Ranchers were sold as low as 3½d. per lb. There was a falling off in the supply of British mutton, and sales were effected at an advance of ½d. per lb. There was no first quality British veal, and second quality was quoted at 7d. per lb.

Latest Markets.—The last Islington market day fell on the 28th, and in some respects there was an improvement in the tone of business. All the best of the cattle were more easily sold at late rates, but these were all found amongst the Herefords, Welsh Runts and Devons. Shorthorns were, if anything, in still lower condition than ever and sold badly at another reduction of ½d. per lb., making the top price 6d. Sheep were in smaller supply, and a clearance became possible. Small tegs and Irish Longwools made 8½d. and 7½d. per lb., and other sorts were fairly firm. Norwich market on the 26th was unchanged for beef, but lower for mutton.

Store Stock.—With the reduced value of mutton, the sales and markets of store sheep could not fail to record a considerable fall from last year; but trade, so far, has certainly been no worse than was expected. The prospects of winter keep vary very much in different parts of the country, and the amount of the fall in sheep values is thereby largely influenced. The fall, however, is very general, and some sales and fairs have failed to produce sufficient buyers to clear the supplies. Compared with last year the prices quoted show in some instances as much as 12s. per head, and in others not more than 4s., decline. There has been more general disposition to buy cattle, and those of good breeding and quality have usually found purchasers at prices not much less than last year. As usual, there is a good demand for cows coming into profit for the winter dairy, and at Islington on the 28th some extra good ones realised £27 per head without their calves.

REVIEW OF PROVISION TRADE IN SEPTEMBER.

HEDLEY STEVENS.

Bacon.—During the first part of September the demand was very disappointing, and importers found it difficult to dispose of mild-cured parcels. The wet weather made buyers very cautious. During the slump in prices in the month of August merchants laid in fair stocks at the low prices, anticipating a much improved consumptive demand; but in this they were disappointed, which meant they were not in a position to handle the fresh arrivals freely, and in order to encourage business prices were again reduced.

By the middle of the month the weather conditions somewhat improved all over the country; this gave a healthier tone to the market, and a general hardening of prices followed. The prices for pigs in all countries are higher than for some time past, and it is anticipated that bacon will be dear for some months.

The arrivals from America and Canada continue exceptionally small; and those from Denmark are also low.

English bacon shows a further advance of about 2s. per cwt. on the month. English pigs ready for the bacon curer continued in small supply, although by the end of the month larger quantities were on offer. Irish pigs continue to arrive in small numbers.

Butter.—Buyers are still adopting a hand-to-mouth policy and prices are abnormally high. Irish and Canadian have advanced 2s. to 3s., Danish and Swedish 5s. to 6s., for the month, others being unchanged.

Throughout the month imports have been much in excess of the demand, resulting in additions to the stocks in cold storage. The demand has been mostly for best selections. The markets in America continue to advance, and this has almost stopped exports from that country. A good autumn make is reported in Siberia. Shipments from Canada have fallen off, there being no encouragement for merchants to import at present prices.

Cheese.—The market has lacked animation throughout the month. Advices from Canada report that high prices are being paid at country markets, and that purchases of the autumn makes are being made, largely for England for storing purposes, to be shipped during the winter months. In some districts during September the weather was reported to be very hot and dry, with a consequent shrinkage in the make.

Exports from 1st May to 19th September show a shrinkage compared with last year of 157,000 cheeses. At the end of the month the estimated stocks of Canadian at the principal distributing centres (London, Liverpool and Bristol) showed an increase of about 8,000 over last year's estimates.

Advices from New Zealand point to a larger make of cheese there.

The much-needed rain in the early part of the month improved the flow of milk in this country, but it is generally conceded that the make will be less than last year, when it was unusually large. At Frome Annual Fair on 30th September, which is the largest held in the West of England, the pitch was about 20 per cent. less than last year.

Eggs.—September opened with a small demand, but it improved by the middle of the month, resulting in a general advance in prices. Arrivals of Russian eggs were very large.

PRICES OF AGRICULTURAL PRODUCE,
AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND
in the Month of September, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	ENGLAND:		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—				
Cattle :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Polled Scots	s. d.	s. d.	s. d.	s. d.
Herefords	8 0	7 7	39 4	35 6
Shorthorns	7 10	7 1	—	—
Devons	8 2	7 5	38 1	34 7
	per lb.*	per lb.*	per lb.*	per lb.*
Veal Calves	d.	d.	d.	d.
	8	7½	8½	6½
Sheep :—				
Downs	8	7	—	—
Longwools	7½	6½	—	—
Cheviots	8	7½	8	7½
Blackfaced	7½	6½	7½	6½
Cross-breds	7½	7	8	7½
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 6	6 0	6 4	5 6
Porkers	6 10	6 5	6 7	5 11
LEAN STOCK :—				
Milking Cows :—	per head.	per head.	per head.	per head.
Shorthorns—In Milk ...	£ s.	£ s.	£ s.	£ s.
" —Calvers ..	21 4	17 19	22 7	17 8
Other Breeds—In Milk ..	21 1	18 3	19 5	17 0
" —Calvers ..	20 7	14 7	19 10	15 19
	15 10	14 0	19 19	15 18
Calves for Rearing	2 4	1 15	1 17	1 8
Store Cattle :—				
Shorthorns—Yearlings ..	9 13	8 2	9 14	8 0
" —Two-year-olds ..	13 10	11 17	14 18	12 7
" —Three-year-olds ..	15 17	14 6	—	13 12
Polled Scots—Two-year-olds ..	—	—	14 18	12 15
Herefords— "	14 7	13 7	—	—
Devons— "	15 0	13 5	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs, and Lambs—				
Downs or Longwools	34 2	29 7	—	—
Scotch Cross-breds	—	—	25 0	20 1
Store Pigs :—				
Under 4 months	22 2	15 10	19 9	14 5

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of September, 1908

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birming-ham.	Man-chester.	Liver-pool.	Glas-gow.	Edin-burgh.
BEEF :—		per cwt. s. d.					
English	1st	54 0	52 0	49 6	—	58 6*	56 6*
	2nd	50 6	48 0	46 0	—	55 6*	50 0
Cow and Bull	1st	42 0	46 0	42 0	39 6	42 6	45 0
	2nd	35 0	42 6	36 6	35 6	36 0	38 0
U.S.A. and Cana-dian :—							
Port Killed	1st	54 0	51 6	48 6	49 0	50 6	—
	2nd	50 6	46 0	45 0	44 6	43 6	46 0
Argentine Frozen—							
Hind Quarters ...	1st	40 0	43 6	42 6	41 6	44 6	43 0
Fore " "	1st	32 6	34 0	32 6	32 6	32 6	34 6
Argentine Chilled—							
Hind Quarters ...	1st	46 0	47 0	43 6	45 6	43 6	52 6
Fore " "	1st	32 0	34 0	32 6	32 6	31 0	—
American Chilled—							
Hind Quarters ...	1st	58 6	58 0	56 6	56 6	56 0	59 6
Fore " "	1st	36 6	39 6	38 0	38 0	37 6	40 6
VEAL :—							
British	1st	70 0	60 6	64 0	70 6	—	—
	2nd	65 6	52 6	56 0	65 6	—	—
Foreign	1st	70 0	—	—	—	—	67 6
MUTTON :—							
Scotch	1st	66 6	—	—	—	67 6	63 0
	2nd	62 0	—	—	—	52 6	53 6
English	1st	60 0	67 6	62 0	62 0	—	—
	2nd	55 6	55 0	57 0	57 0	—	—
U.S.A. and Cana-dian :—							
Port killed	1st	—	—	—	—	—	—
Argentine Frozen ...	1st	32 6	34 0	32 6	32 6	34 0	33 0
Australian " "	1st	31 6	32 6	31 0	31 0	32 6	—
New Zealand " "	1st	41 0	—	—	—	42 0	—
LAMB :—							
British	1st	67 6	63 0	61 6	63 0	67 6	66 0
	2nd	65 6	59 6	57 0	57 6	53 6	55 0
New Zealand	1st	52 0	54 0	51 6	51 6	55 0	58 0
Australian	1st	48 0	48 6	—	46 6	—	—
Argentine	1st	—	47 0	49 0	49 0	42 0	—
PORK :—							
British	1st	57 0	60 0	61 0	59 6	52 6	53 0
	2nd	51 6	55 0	56 0	55 0	50 0	45 0
Foreign	1st	55 0	61 0	60 6	60 6	—	—

Scotch.

AVERAGE PRICES of British Corn per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1906, 1907 and 1908.

Weeks ended (in 1908).	Wheat.			Barley.			Oats.		
	1906.	1907.	1908.	1906.	1907.	1908.	1906.	1907.	1908.
Jan. 4	28 4	26 0	35 1	24 6	23 11	26 9	18 2	17 3	18 4
" 11	28 6	26 1	35 2	24 8	24 2	26 9	18 4	17 4	18 3
" 18	28 5	26 1	35 5	24 11	24 1	27 1	18 4	17 5	18 5
" 25	28 7	26 2	35 6	25 1	24 5	26 11	18 7	17 5	18 5
Feb. 1	28 10	26 3	35 0	25 1	24 4	26 11	18 10	17 5	18 4
" 8	28 10	26 6	34 3	25 3	24 5	26 9	18 10	17 7	18 3
" 15	28 11	26 7	33 1	25 6	24 1	26 9	19 0	17 7	18 0
" 22	28 10	26 10	32 6	25 4	24 2	26 5	19 0	17 9	17 11
" 29	28 8	26 9	30 11	25 0	24 2	26 3	19 0	17 9	17 8
Mar. 7	28 5	26 8	30 5	25 1	23 11	26 1	18 8	17 11	17 8
" 14	28 5	26 10	31 3	24 8	24 2	26 0	18 10	18 0	17 10
" 21	28 4	26 10	31 7	24 4	24 0	26 2	18 8	18 1	17 11
" 28	28 3	26 8	31 4	24 5	23 9	25 10	18 11	18 2	17 10
Apl. 4	28 7	26 9	31 3	24 2	24 3	25 5	18 11	18 3	17 9
" 11	28 11	26 8	31 2	24 4	23 9	25 10	19 4	18 6	17 7
" 18	29 4	26 8	30 11	24 0	23 3	26 1	19 1	17 7	17 7
" 25	29 6	26 10	30 10	24 0	23 3	25 5	19 6	18 9	17 9
May 2	29 10	27 0	31 6	23 10	23 6	25 8	19 9	19 3	18 0
" 9	30 1	27 6	32 4	24 1	24 0	25 5	20 0	19 7	18 4
" 16	30 3	28 4	33 1	23 10	23 10	24 9	20 1	20 1	18 7
" 23	30 4	29 7	33 8	24 2	24 3	25 9	20 2	20 5	18 10
" 30	30 4	31 4	33 5	22 10	24 0	24 6	20 5	20 8	18 8
June 6	30 3	32 3	33 1	23 4	24 7	25 10	19 11	20 7	18 4
" 13	30 4	31 10	32 7	23 6	24 7	24 5	20 2	20 11	18 4
" 20	30 5	31 4	32 0	22 10	24 11	24 2	20 2	20 9	18 5
" 27	30 3	31 2	31 5	24 3	24 6	24 0	20 1	20 8	18 7
July 4	30 2	31 3	30 11	23 0	24 8	23 11	20 2	20 11	18 7
" 11	30 5	32 0	30 5	23 8	24 10	24 4	20 4	20 11	18 5
" 18	30 3	32 6	30 7	23 2	24 6	23 1	20 5	21 1	18 5
" 25	30 5	32 11	31 5	22 4	27 3	26 5	20 2	20 8	18 6
Aug. 1	30 9	33 2	31 10	22 1	26 4	24 4	19 3	21 2	18 7
" 8	30 5	33 5	31 6	23 0	26 6	23 1	17 11	21 3	18 9
" 15	29 0	33 6	31 6	24 2	25 9	23 10	17 0	20 4	18 1
" 22	27 9	33 7	31 2	25 0	25 0	24 5	16 10	19 8	17 10
" 29	26 9	33 10	30 10	24 3	24 6	24 5	16 6	18 11	17 1
Sept. 5	26 4	31 11	30 10	24 9	24 2	25 5	16 3	17 7	17 3
" 12	25 11	31 4	31 5	24 3	24 4	25 11	16 1	17 6	17 6
" 19	25 9	31 5	31 7	24 3	25 0	26 0	16 0	17 6	17 3
" 26	25 9	31 8	31 5	24 8	25 3	26 8	16 2	17 8	17 2
Oct. 3	26 1	32 6	31 7	25 0	25 5	26 11	16 3	17 9	17 2
" 10	26 3	33 3	31 5	25 3	25 9	27 5	16 7	17 11	17 0
" 17	26 6	34 4		24 10	26 3		16 8	18 0	
" 24	26 7	35 9		24 10	27 2		16 10	18 7	
" 31	26 7	36 3		24 8	27 7		16 11	18 10	
Nov. 7	26 6	35 10		24 8	27 8		17 1	18 10	
" 14	26 4	35 1		24 4	27 8		17 2	18 8	
" 21	26 3	34 7		24 1	27 5		17 3	18 9	
" 28	26 1	34 7		24 1	27 5		17 2	18 7	
Dec. 5	26 1	34 7		24 1	27 1		17 4	18 6	
" 12	26 1	34 8		23 11	27 0		17 3	18 5	
" 19	26 3	34 9		24 3	27 1		17 3	18 3	
" 26	26 0	34 6		24 1	26 10		17 3	18 0	

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates: Wheat, 60 lbs.; Barley, 50 lbs.; Oats, 39 lbs. per Imperial Bushel.

AVERAGE PRICES of Wheat, Barley, and Oats per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

	WHEAT.		BARLEY.		OATS.	
	1907.	1908.	1907.	1908.	1907.	1908.
France :			s. d.	s. d.	s. d.	s. d.
August	...	42 7	37 9	25 9	25 4	21 2
September		39 10	38 7	25 1	25 9	19 10
Paris :			s. d.	s. d.	s. d.	s. d.
August	...	43 9	38 4	26 11	26 2	21 7
September		40 6	39 9	26 8	26 2	20 5
Belgium :			s. d.	s. d.	s. d.	s. d.
July	...	35 4	34 5	25 5	25 1	24 0
August	...	35 2	34 5	25 0	25 4	23 3
Germany :			s. d.	s. d.	s. d.	s. d.
July	...	45 4	44 9	30 7	26 9	27 5
August	...	45 3	42 11	27 9	27 9	25 4
Berlin :			s. d.	s. d.	s. d.	s. d.
July	...	44 8	47 5	—	—	26 9
August	...	45 8	43 8	—	—	26 8
Breslau :			s. d.	s. d.	s. d.	s. d.
July	...	44 8	43 11	(brewing)	(brewing)	24 7
August	..	44 7	43 9	{ 29 0 26 6 (other) 28 11 (brewing) 26 6 (other)}	{ 28 6 26 0 (other) 30 8 (brewing) 26 0 (other)}	20 6

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets. The mark is now taken as equal to 11·8d., and the German prices for the former year have been recalculated on this basis.

AVERAGE PRICES of British Wheat, Barley, and Oats at certain Markets during the Month of September, 1907 and 1908.

	WHEAT.		BARLEY.		OATS.	
	1907.	1908.	1907.	1908.	1907.	1908.
London...	...	s. d.	s. d.	s. d.	s. d.	s. d.
...	...	32 9	32 8	25 9	26 0	18 7
Norwich	...	31 3	30 1	25 7	27 1	17 0
Peterborough	...	31 2	30 8	24 1	25 4	16 11
Lincoln...	...	31 8	30 11	24 5	25 7	17 5
Doncaster	...	33 11	31 3	25 3	25 0	19 2
Salisbury	...	31 0	31 0	24 7	27 3	17 6

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain
MARKETS in ENGLAND and SCOTLAND in the Month of
September, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Bristol.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
BUTTER :—	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
British ...	per 12 lb. 14 0	per 12 lb. 12 6	per 12 lb. 14 0	per 12 lb. 13 0	per cwt. —	per cwt. —	per 12 lb. 15 0	per 12 lb. —
Irish Creamery ...	116 6	113 0	120 6	117 0	114 0	110 6	116 0	per cwt. —
„ Factory ...	109 0	105 0	108 0	104 6	105 6	100 0	—	—
Danish ...	121 0	118 6	—	—	120 6	117 0	119 0	—
Russian ...	109 0	106 0	111 0	107 6	110 0	105 0	107 6	103 6
Canadian ...	116 6	114 6	119 0	115 0	115 0	112 0	—	—
New Zealand ...	116 0	114 0	—	—	—	—	—	—
CHEESE :—								
British—								
Cheddar ...	68 6	63 0	76 0	64 0	70 0	65 0	64 0	60 0
Cheshire ...	—	—	—	—	120 lb. 67 0	120 lb. 61 0	—	—
Canadian ...	61 6	60 6	61 6	59 0	60 6	59 6	61 0	60 0
BACON :—								
Irish ...	69 6	66 0	—	—	70 6	65 6	69 6	66 0
Canadian ...	62 0	61 0	62 0	58 6	62 0	58 6	63 0	60 6
HAMS :—								
Cumberland ...	103 0	91 0	—	—	—	—	—	—
Irish ...	100 6	89 6	—	—	—	—	102 0	92 6
American (long cut) ...	54 0	52 6	55 0	51 0	57 0	51 0	58 0	56 0
Eggs :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British ...	12 11	11 8	12 3	11 8	11 5	—	—	—
Irish ...	11 4	10 4	10 0	9 6	10 6	9 6	10 7	9 1
Danish ...	10 9	9 9	9 11	9 0	10 6	10 0	10 6	9 0
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
British Queen ...	61 6	51 6	72 6	67 6	51 6	46 6	53 6	41 0
Royal Kidney ...	80 0	70 0	72 6	67 6	66 6	61 6	—	—
Up-to-Date ...	66 6	51 6	70 0	55 0	51 6	45 0	53 6	40 0
HAY :—								
Clover Meadow ...	93 6	75 6	73 0	—	77 6	57 0	64 6	59 6
	81 6	66 0	65 6	—	—	—	47 0	42 0

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	SEPTEMBER.		9 MONTHS ENDED SEPTEMBER.	
	1908.	1907.	1908.	1907.
Swine-Fever :—				
Outbreaks	122	138	1,593	1,961
Swine Slaughtered as diseased or exposed to infection ...	900	717	9,400	9,212
Anthrax :—				
Outbreaks	62	78	822	828
Animals attacked	78	102	1,093	1,094
Foot-and-Mouth Disease :—				
Outbreaks	—	—	3	—
Animals attacked	—	—	112	—
Glanders (including Farcy) :—				
Outbreaks	76	39	631	667
Animals attacked	161	85	1,919	1,525
Sheep-Scab :—				
Outbreaks	10	5	647	421

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	SEPTEMBER.		9 MONTHS ENDED SEPTEMBER.	
	1908.	1907.	1908.	1907.
Swine-Fever :—				
Outbreaks	9	11	141	120
Swine Slaughtered as diseased or exposed to infection ...	384	408	3,247	2,078
Anthrax :—				
Outbreaks	I	I	7	2
Animals attacked	I	I	10	4
Glanders (including Farcy) :—				
Outbreaks	—	I	—	5
Animals attacked	—	I	—	9
Sheep-Scab :—				
Outbreaks	3	9	279	199

ADDITIONS TO THE LIBRARY.

[NOTE.—The receipt of annual publications of foreign agricultural and other departments, experiment stations and societies is not noted in the monthly list of additions to the Library, but a list of all such publications, which are regularly received, will be given from time to time.]

Great Britain—

MacDonald, Jas.—Stephens' Book of the Farm. 5th Edition. Div. III. (250 pp. + 11 plates.) London : Wm. Blackwood & Sons, 1908. 10s. 6d.

Royal Horticultural Society. Journal. Vol. XXXIV. Part I. (160 + xc pp.) London : Spottiswoode, 1908. Price (to non-Fellows) 5s.

Encyclopaedia of Agriculture.—Edited by C. E. Green and D. Young. Vol. III. (633 pp.). Edinburgh & London : Wm. Green & Sons, 1908. 20s. net.

Brewer, G. W. S.—Home-Bottled Fruits and How to do Them. (36 pp.) Cheltenham : Harvey & Healing, 1908. 6d. net.

France—

Houard, C.—Les Zoocécidies des Plantes d'Europe et du Bassin de la Méditerranée. Tome 1^{er}. (569 pp.) Paris : Hermann, 1908.

Germany—

Müller, H. A. C.—Die preussischen Agrargesetze. (64 pp.) Neudamm : Neumann, 1908.

Spain—

Estadística Pecuaria formada por la Asociación General de Ganaderos. (116 pp.) Madrid : Imprenta Alemana, 1908.

United States—

Department of Agriculture, Bureau of Plant Industry.—Circ. 1.—Self-Boiled Lime-Sulphur Mixture as a Promising Fungicide. (18 pp.) Circ. 2.—An Improved Method of Separating Buckhorn from Red Clover and Alfalfa Seeds. (12 pp.) Circ. 3.—Some Stem Tumors or Knots on Apple and Quince Trees. (16 pp.) Circ. 4.—The Treatment of Damping-off in Coniferous Seedlings. (8 pp.) Circ. 5.—Barley Culture in the Northern Great Plains. (12 pp.) Circ. 7.—The Field Treatment of Tobacco Root-Rot. (8 pp.) Circ. 8.—The Smuts of Sorghum. (9 pp.) Bull. 121.—Part I, The Supposed Relationship of White Snakeroot to Milksickness, or "Trembles"; Part II, Mountain Laurel, a Poisonous Plant; Part III, Results of Loco-Weed Investigations in the Field and Laboratory Work on Loco-Weed Investigations; Part IV, The Sources of Arsenic in certain Samples of Dried Hops; Part V, Apple-Leaf Spot caused by Sphaeropsis Malorum; Part VI, The Immunity of the Japanese Chestnut to the Bark Disease. (59 pp.) Bull. 122.—Curly-Top, a Disease of the Sugar-Beet. (37 pp.) Bull. 124.—The Prickly Pear as a Farm Crop. (37 pp.) Bull. 125.—Dry-Land Olive Culture in Northern Africa. (48 pp.) Bull. 127.—The Improvement of Mountain Meadows. (29 pp.) Bull. 131.—Part I, The Germination of Vegetable Seeds; Part II, The Botanical History and Classification of Alfalfa; Part III, The Cross-Inoculation of Fruit Trees and Shrubs with Crown-Gall; Part IV, Recent Studies of the Olive-Tubercle Organism. (42 pp.) Washington, 1908.

Bureau of Soils :—Bull. 48.—Fertility of Soils as affected by Manures. (59 pp.) Bull. 50.—Moisture Content and Physical Condition of Soils. (70 pp.) Bull. 51.—Absorption of Vapours and Gases by Soils. (50 pp.) Washington, 1908.

[Books may be borrowed from the Board's Library on certain conditions, which may be ascertained on application.]

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SMALL HOLDINGS IN SOUTH-WEST LANCASHIRE.*

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Lancashire is essentially a county of small farms. In the south-western portion of the county, particularly in the district situated along the first twenty miles of the route from Liverpool to Preston, small holdings are especially numerous. A large proportion of the holdings in this district are under 50 acres, and few exceed or even approach 100 acres in extent. That the division of the land into small farms is of no recent date is evident from the character and age of the houses and buildings upon them. There is little evidence of any great change in the size of the holdings having taken place for a long period, the most notable occurrence in this direction being the gradual disappearance of the smallest class of holdings in the districts most remote from the towns.

Soil.—The soil throughout the district is derived from the rocks of the New Red Sandstone series, and like most soils of similar origin is naturally productive. For the main part it is a free-working loam, which readily responds to liberal manuring and is well suited to potato culture and market gardening.

* Previous articles on Small Holdings have appeared as follows:—The Creation of Small Holdings under the Act of 1907, *Mrs. Roland Wilkins (L. Jebb)*, April, 1908; Small Holdings in Hampshire, *J. C. Newsham, F.L.S.*, May, 1908; Small Holdings in Herefordshire, *J. O. Peet, B.Sc.*, August, 1908.

Two main types may be recognised amongst the methods adopted in the management of the small holdings, the extent to which each prevails being determined apparently by the distance from a market.

Holdings for market gardening.—Within 10 miles of Liverpool along the route mentioned, market gardening is extensively practised. No cattle or sheep are kept, even on the larger farms, beyond a cow or two for the supply of the farmer's family. The whole of the holder's energy is devoted to the production of crops which he can market without the aid of cattle or sheep. The crops cultivated include the whole range of garden crops with the exception of those which require to be raised in glass-houses. Even on the smallest holdings there is rarely any glass beyond what is necessary for raising early plants for transplanting out of doors. All the produce is disposed of in the market at Liverpool and the wagons haul dung from the town on the return journey. Small holdings on this area range from about 6 to 40 acres, the latter being quite a usual size. On the smaller holdings cases of failure or even of partial failure have been by no means common ; at the same time instances of the occupiers increasing their capital and moving on to larger holdings, which are reported to have been frequent thirty or more years ago, have been rare in recent times. Holdings of 30 or 40 acres, however, appear to be a useful and convenient size, and there are numerous cases of men doing extremely well on small farms of this size. Rents average about £3 10s. to £4 10s. per acre for the latter class of holdings ; for the smaller ones they range as high as £5 per acre.

Ten miles is evidently the maximum distance which it is considered convenient to haul farm or garden produce to market, for beyond the tenth mile or so from Liverpool a different system is practised in the management of the holdings and the disposal of the produce.

In the district lying midway between Liverpool and Preston there are few very small holdings, though farms of 40 acres or so are numerous. The tendency of late years has been to add farms much smaller than this to larger ones, as they become vacant. Previous to the development of the Jersey early potato trade, about 30 years ago, there were many holdings of 3 to 6 acres in this district and their occupiers were

quite a successful class of men. They worked for farmers in the neighbourhood, and in addition to keeping a cow and pigs, they secured a fair income from the cultivation of early potatoes and onions.

System of early potato growing formerly practised.—Considerable quantities of early potatoes were grown by these men upon a system which is now only of historical interest. The ground was laid out in plots 9 ft. wide surrounded by banks of turves about 15 in. high. Each year the plots were dug, manured with dung, and well prepared by means of hand labour, and were then planted with sprouted potatoes about 9 in. apart each way. During the early stages of growth the potatoes were protected by means of screens, made of straw and strengthened with sticks or small branches which were supported by the turf banks and three light structures of wood, a higher one down the middle of the plot, and a lower one on each side. The screens, which thus formed a sloping roof on each side of the plot, were removed during the day, except in bad weather, and replaced at night until there was no longer danger of frost. High prices were regularly realised for the early crops grown in this way, frequently as much as 1s. per lb. at the commencement of the season.

Onion cultivation.—The cultivation of onions was not confined to the small holdings. A partnership was arranged between the small holder and a neighbouring farmer ; the former supplied labour and seeds while the latter furnished land and manure and did the hauling. The crop was divided equally between them at harvest time. Many farms had 10 or 12 acres of onions, and the arrangement was found profitable to both parties. It may be observed that in the cultivation of both the early potato crop and the onion crop, when planting was accomplished, practically the whole of the remaining labour was of a light character, hoeing and weeding, and was performed mainly by the wife and children of the small holder. Children were engaged in this work at an age at which they must now be in attendance at school.

Small farms.—The system of cropping the small holdings in this district, which it has already been stated are mostly about 40 acres in area, is similar to that adopted on the larger farms in

the immediate neighbourhood. A few cattle are generally kept, say three or four cows and some young stock, but no sheep. The rotation usually practised is a five-course one, consisting of early potatoes (with catch crops of cabbages, cauliflowers, &c.), oats, late potatoes, wheat, seeds (clover and ryegrass). An alternative course of cropping adopted to a less extent is early potatoes with catch crops, late potatoes, wheat, oats or barley, seeds. Seeds are rarely allowed to remain more than one year. The success of agriculture in the district is mainly dependent upon the potato crop and its accompanying catch crops ; special attention is devoted to their cultivation, and in no part of the country is the potato crop seen in greater perfection. The method adopted in the management of the early crop and the succeeding green crop is practised but little, and possibly not at all, outside the county ; there must, however, be many localities for which it is well suited and to which it could be introduced with advantage. It had its origin in the market garden area near Liverpool, and has extended over a wide area in this district during recent years. It is now extensively practised in parishes where it was practically unknown fifteen years ago.

Potato growing.—The early potato crop is almost invariably taken after seeds, for the crop is found to flourish better and also to be of better quality when following sward. The sward is lightly ploughed—skimmed or pared—in autumn, and after the turf has decayed it is pulled to pieces with the cultivator and harrows. A good deep furrow is then taken and the ground remains in this condition until spring. Dung is very rarely ploughed in during autumn or winter ; most of those who have tried this method find that it does not answer. After the land has been brought into a good tilth in spring, it is drawn out into ridges 27 in. wide, and dung is applied in the furrows at the rate of 20 to 25 tons per acre. The dung comes from Liverpool and other Lancashire towns ; its cost varies with the season, but in spring it can generally be obtained delivered at the local railway stations at about 6s. to 7s. per ton. The use of artificial manures either alone or in conjunction with dung, is exceptional. The ridges are split to cover the dung, and the potatoes, previously sprouted in boxes, are either planted in holes, made along the

top of the ridge with a dibbler, and filled, after the sets have been deposited in them, by the stroke of a fork, or they are worked in with a spade. In the latter method of planting, a workman sticks his spade into the ridge and lifts the soil a little both upward and forward, while another labourer deposits a set in the hole he has thus made. When the spade is withdrawn the soil falls back over the set. Anyone unacquainted with this mode of planting would think it slow and expensive, but it is not really so. A couple of workers taking turns at the spade and the potato-basket can plant three-quarters of an acre in a day. The open furrows and the sides of the ridges are kept clean after planting by means of horse-hoeing, and, if it can be done without injury to the sets, saddle harrows are run over the tops of the ridges. As soon as the whole of the young shoots are well above ground the crop is hand-hoed and cleaned, the cultivator, set as wide as possible without disturbing the potatoes, is worked deeply between the rows, after which the crop is moulded up. This often completes the cultivation of the potato crop to the time of digging, but more frequently it is followed by another round of the cultivator and moulding plough.

Plants for the catch crop have by this time been raised on a seed-bed, and the furrows between the ridges are now prepared for their reception. Little mounds of earth are made along the furrows by means of a horse implement known locally as a "rooker," the working parts of which consist of one or more cultivator tines and a spade. The tines stir the soil, which is then collected by the spade and deposited at intervals of $2\frac{1}{2}$ or $2\frac{1}{4}$ ft. by the workman lifting the handles. A wheel in front regulates the depth of the work. Planted upon these mounds the cabbages or cauliflowers become well established and make a certain amount of growth before the potato crop is removed. Varieties of potatoes which produce little or only a moderate amount of haulm are preferred on account of their favouring the catch crop. The potatoes are necessarily dug by hand and the green haulm is buried in the furrows. As soon as the cabbage or cauliflower crop has entire possession of the land, a dressing of nitrate of soda is usually applied. The remaining cultivation is simple, consisting merely of once cultivating between the rows and moulding up, and tends to

bring the dung which was under the potato rows close to the young plants. Under favourable circumstances the ground is, soon after the potato crop is marketed, almost completely covered again with a thriving crop. Returns under this system vary, of course, according to the markets and the earliness of the potato crop. Under the best conditions as much as £45 per acre must frequently have been made in recent years, while £37 per acre may be looked upon as a fair average result. These figures refer, of course, to the two crops produced in one year, but occurring on the same land only once in five years.

Disposal of Crops.—Almost the whole of the produce from this district, including potatoes, vegetables, grain, hay, and straw, is disposed of to dealers, by whom it is despatched mainly to Lancashire and Yorkshire towns. It is delivered by the grower to the nearest railway station. In many seasons, however, large quantities of cabbages are sent from the district to the London markets, in fact, a London demand is considered essential for a good trade. The extension of this system of cropping has resulted in increased facilities for disposing of the produce. Formerly salesmen came out from the large towns to purchase their supplies ; now there are many agricultural produce merchants who reside and have their main offices and warehouses in the district. Some of these merchants, natives of the district, have built up extensive businesses and have temporary branches in the Channel Islands during the early potato season and in other parts of the country.

Factors in the Success of Small Farms in this District.—From an agricultural point of view the whole district is undoubtedly favoured in many ways, and the following may be taken to be the main points conduced to the success of these small farms :—

(1) *Fertility of Soil.*—The soil is naturally fertile and is especially suited to the cultivation of potatoes and market garden crops. The climate is also equally favourable.

(2) *Proximity of Populous Centres and Good Markets.*—The numerous Lancashire towns and some of the Yorkshire ones provide a ready outlet for the produce, though, as has already been stated, some of it goes much further afield. The towns also provide a supply of dung for use on the farms, to such an

extent that artificial manures, with the exception of nitrate of soda, are little used. There is good railway communication, as is usually the case near populous centres, and the stations are not far apart. A good portion of the district has the additional advantage of water carriage by canal, which is cheaper than by rail, and is a great benefit, particularly in regard to the supply of dung. The country is practically level, a fact conducive to economy of horse labour.

(3) *Industrious Habits of the People.*—Both occupiers and labourers are a hard-working and strenuous race. There is, perhaps, no system of managing land which makes greater demands upon the physical endurance of the labourers than market gardening, especially when the produce is hauled to a market 8 or 10 miles distant. The rate of wages is high, a natural result of the competition for labour of the railways and the not far distant factories, collieries, and works of various kinds. At the same time the labour, compared with that of districts where a lower rate of wages prevails, is not expensive. Ploughmen usually receive from 21s. to 24s. per week, and work in the fields with their teams from 7 to 12 in the morning and from 1.30 to 6 in the afternoon when the length of the day allows it, with a break of half-an-hour both morning and afternoon. Labourers get from 18s. to 24s. per week, and work from 6 o'clock in the morning to 6 in the evening, with an hour off at noon and half an hour morning and afternoon. To give some idea of the labour performed it may be mentioned that one man will fill about 30 tons of dung in a day from a heap in the field, and when potato-lifting with the fork in a full crop will frequently dig, pick up, and carry to a cart over a ton a day, sometimes as much as 25 cwt. This is by day work; the usual rate of pay for piece-work is 1½d. per 20 yards in the row.

Practically all the men occupying these small farms follow the occupation of their fathers and learned the business in this way. There are few instances of persons reared in towns taking up holdings here, and it is rarely that anyone from outside the district does so. The labourers also seldom become small holders, though, with thrifty habits and high wages, they have a good chance of doing so if they desire.

FARMYARD MANURE.

A. D. HALL, M.A.

Director of the Rothamsted Experimental Station.

III. THE COST OF MAKING FARMYARD MANURE.*

What price should be set upon a ton of farmyard manure is a question often asked, but no general answer is possible, since so much depends upon the other conditions prevailing upon the farm. As a rule farmyard manure is part of the normal output of the farm, the farmer has only to use it to the best advantage and is not concerned with the question of whether it would be cheaper to replace it with an equivalent amount of some other fertiliser. There are, however, occasions when the problem does arise of whether it is cheaper to make farmyard manure, to buy it, or to attempt to replace it with artificials; for example, the men who are farming specially for potatoes or hops often fatten bullocks or pigs solely for the sake of the manure thus made, and are content to lose money on the live stock because of the value of the dung. Since farmyard manure made in this way is often a very expensive article it is important to try and put some monetary value on it, so that the farmer may attain a clearer idea of the profit or loss attached to the keeping of live stock as manure makers. It is, of course, possible to treat farmyard manure like any other fertiliser and value it on the unit system, the result of which would be somewhat as follows :—

Farmyard manure contains :—	s. d.
·6 per cent. nitrogen at 12s.	7 2
·3 , phosphoric acid at 3s.	0 11
·6 , potash at 4s.	2 5
Value per ton	<hr/> 10 6

Such a valuation, however, gives but little information, because the unit values are taken from concentrated manures and do not apply to dung; for example, nitrogen in waste materials like shoddy can often be obtained at half the price paid for it in sulphate of ammonia or nitrate of soda, and considering the slow availability of much of the nitrogen in dung its unit

* The previous articles were :—Farmyard Manure, I. Losses during Making and Storage, April, 1908, p. 7; Farmyard Manure, II. Its Value as a Fertiliser, June, 1908, p. 161.

value should be much below 12s. On the other hand, the organic matter supplied in the farmyard manure is not valued, yet it is for the effect of this organic matter on the texture of the soil that farmyard manure is most generally required. The cost of handling farmyard manure, which is so much greater than it is for an equivalent amount of artificial fertiliser, should also be taken into comparison, but cannot well be estimated, since it will vary on each farm.

While it is thus practically impossible to value farmyard manure on its composition, a proper system of bookkeeping will show what it costs to make in a manner that is independent of the profit and loss upon the live stock, and will also enable a farmer to form for himself a clear idea of the economics of dung making as compared with the purchase of either town manure or artificial fertilisers. The most valid principle on which the cost can be worked out, and one which does justice equally to the live stock and to the manure, is to charge the dung made with the litter and the manure value of all the foods consumed in the yards or boxes. This is indeed, as far as purchased foods go, exactly what the valuer would allow to an outgoing tenant for the fertilising material which he brought on to the farm during the year of his tenancy and which he leaves behind in the form of dung. Of course the valuer does not allow compensation for the roots, hay and straw grown on the farm; these, however, must be reckoned in making up the cost of the dung.

The manure value of any food is based upon its composition, and represents the value at current market rates of whatever part of the food has a fertilising value and may be supposed to find its way into the manure; the values employed below are derived from Voelcker and Hall's paper in the *Journal of the Royal Agricultural Society* for 1902, p. 76, and are those recommended by the Central Chamber of Agriculture for adoption in farm valuations. To arrive at the cost of the dung the manure values of all the food consumed must be taken and added to the whole cost of the litter, whether straw or peat moss, the sum is then divided by the amount of manure ascertained to have been made. In Table XVI this principle is applied to the data obtained from some of the feeding experiments, already quoted (see *Journal*,

April, 1908, pp. 18-19), and also to two cases extracted from the accounts of an ordinary farm. The first column gives the nature of the food and the second its manure value per ton; the remaining double columns give for each food the amount consumed in the experiment and its manure value. The cost of the litter is set out below and added to the manure values gives the total cost of the manure made in each case, the amount of which is also shown.

Working on these lines we find that farmyard manure costs from 7s. to 10s. a ton to make on the farm, without taking into account any profit or loss on the live stock, because this latter question is so much dependent upon the turn of the market and the skill of the dealer. It is necessary to discriminate and to keep the two operations—the making of the dung and the fattening of the cattle—distinct, so that a conclusion can be reached as to the profitability of each separately. Of course, in making out the charges against the cattle, the whole cost of the cake, &c., which they consume must not be taken, but only that part of it which is not debited to the dung as manure value, e.g., if a ton of linseed cake cost £8, only £6 2s. should be charged against the stock for food, because £1 18s., its manure value, would be charged to the manure.

To make this clearer we can draw up a balance sheet for the feeding of two of the heifers already mentioned:—

TABLE XVII.—Cambridge No. 2.

Dr.		Cr.	
Purchase price of 2 heifers...	£ 30 0 0	Manure value of mangolds...	£ 0 15 0
6 tons of mangolds at 5s. ...	1 10 0	" " hay ...	0 7 6
½ ton of hay at 45s. ...	1 2 6	" " cake ...	0 16 10
6 cwt. of decorticated cotton cake at £8 ...	2 8 0	(Charged to dung)	
Attendance, 12 weeks at 6d.	0 6 0	Sale price of heifers...	34 0 0
Balance being profit ...	0 12 10	Total	35 19 4
Total ...	35 19 4		

Thus the feeding has resulted in a small profit of 12s. 10d., and at the same time, as was shown in Table XVI, 5½ tons of farmyard manure were made at a cost of 11s. 8d. per ton, or if the heifers are considered to have been bought and fattened solely for the purposes of making dung and the 12s. 10d. profit is credited to the dung, the latter has cost about 9s. 4d. per ton.

TABLE XVI.—Cost of Making 1 Ton of Farmyard Manure.

Foods.	Royal Agricultural Society's Farm, Woburn.				Cambridge University.				Ordinary Farm.				Wye.	
	1899.	1900.	1901.	1.	2.	1.	2.	1.	2.	1.	2.	1.	Manure Value.	
Manure Value per Ton.														
Peas ...	30·5	—	—	Cwt.	s.	Cwt.	s.	Cwt.	s.	Cwt.	s.	Cwt.	s.	Cwt.
Mangolds ...	2·5	—	—	—	—	—	—	—	—	—	—	—	—	—
Swedes ...	2·5	22	2·8	22·5	2·8	21·5	2·7	15·0	120	15·0	120	15	120	—
Decorated cotton ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Cake ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Undecorated cotton cake ...	34·0	—	—	—	—	—	—	—	—	165	280	75	128	—
Linseed cake ...	38·0	—	—	—	—	—	—	—	—	260	494	170	323	1·6
Oats ...	14·0	—	—	—	—	—	—	—	—	90	63	200	140	—
Barley ...	14·0	2	1·4	—	—	—	—	—	—	—	—	—	—	—
Maize meal ...	14·0	—	—	2·1	1·5	1·5	1·0	—	—	140	98	180	126	—
Bran ...	30·0	—	—	2·1	8·5	3·0	4·8	1·7	—	—	5	8	20	30
Straw ...	7·0	6	—	—	—	2·7	2·0	10	7·5	10	7·5	1,420	1,065	1,860
Hay ...	15·0	—	—	—	—	—	—	—	—	—	—	—	—	—
LITTER:—														
Wheat straw	30·0	10	15·0	10	15·0	9·5	14·2	17·5	26·3	16·5	24·8	1,040	1,560	2,250
Peat moss ...	—	—	37·3	—	—	—	—	—	—	—	—	120	224	4
Total cost ...	28·3	29·3	25·8	48·8	64·1	3,568	4,658	23·3						
Quantity of dung made ...	cwt.	46·7	49·5	43·3	100	9·8	9,200	14,320	90					
Cost per ton ...	s.	12·1	11·8	11·9	11·7	—	7·8	6·5	5·2					

This figure, 7s. to 10s. per ton for farmyard manure, is considerably higher than the usual estimate attached to dung for purposes of valuation or of drawing up the balance sheet of a manorial experiment; it does however, represent what it will cost the potato or hop grower who sets out to keep cattle solely for the purpose of making dung. It is for him to decide whether he can secure sufficient profit from the cattle themselves to make it worth while to produce farmyard manure at such a price.

INSURANCE OF LIVE STOCK IN GREAT BRITAIN.*

One of the oldest forms of co-operation in this country is the mutual insurance of live stock in the form of what are known as cow and pig clubs. No complete returns are available as to their number, but in 1905 the Board ascertained the existence of 1,021 pig clubs in England. Cow clubs are not so numerous as pig clubs, and they are believed to have decreased of late. Some of them, however, have been in existence for a great number of years. One in Shropshire was established in 1838, and had 518 members in 1907 and a reserve fund of £997, while another cow club in the same county dates from 1842, and with 296 members has accumulated a reserve fund of £1,440. The oldest registered society is one established near Ormskirk in Lancashire, which dates from 1807.

The extension in the provision of allotments and small holdings in England makes the establishment of societies of this type of great importance, and it is to be hoped that this simple and effective form of co-operation, which is well known and understood in the rural districts of England, will be largely adopted.

Method of establishing a society.—Live stock insurance societies can be established by mutual agreement, and are not required by law to be registered or formally incorporated in any way, but the Friendly Societies Act, 1896, provides for the optional registration of societies, called in the Act, Cattle Insurance Societies, for the purpose of insurance to any amount

* Information as to the insurance of live stock in Holland, Belgium, France, Switzerland, Germany and Sweden, was given in this *Journal* in April, 1908, p. 32, and as to Denmark and Norway in October, 1908, p. 523.

against loss of neat cattle, sheep, lambs, swine, horses, and other animals by death from disease or otherwise.

The mere fact of registry affords no guarantee of the solvency of a society, but the rules which are necessary for the purpose of complying with the Act do afford valuable help towards good management in various ways and provide certain checks which are wholly wanting in respect of unregistered bodies.

It appears, however, that in England and Wales only 57 of these insurance societies were registered under the Friendly Societies Act on the 31st December, 1906 (the latest date for which complete figures are available). These had a membership of 4,819, or about 84 to each society. The receipts during the year amounted to £2,596 and the payments to £2,150. The total assets at the end of the year were £8,434, or about £148 for each society.

Application for the registry of a cattle (including pigs, horses, &c.) insurance society must be made on a special form to be obtained from the Registrar of Friendly Societies, 28, Abingdon Street, S.W., and must be accompanied by two printed copies of the proposed rules. There is no fee for registration. The Registrar has prepared a set of model rules for the use of friendly societies, but these rules would need to be suitably adapted to the circumstances of a cattle insurance society. A copy of the rules actually adopted could be obtained as an example from any registered society, as societies are bound to supply copies to any person on demand on payment of a sum not exceeding one shilling.

Attention may be directed to the following points, which should receive consideration in drawing up the rules of a society whether registered or unregistered.

Unlimited Liability.—In the case of registered societies the liability of each member for the engagements of the Society is unlimited, and this might lead to serious difficulties if the Society were to undertake the insurance of animals, such, for example, as valuable pedigree stock, to a greater amount than its funds would justify. In practice, however, such societies being understood only to undertake insurances for small amounts, the risks incurred are not great, but it is desirable that the rules should specify the maximum value which may be paid in any one case.

Area Covered by the Society.—It is generally found desirable to limit the operations of the Society to a comparatively small area, such as a few adjacent parishes. It is thus possible for all the members to know each other and the cost of management can be reduced to a minimum. If, on the other hand, the members were to be distributed over any considerable area, the duties of inspection, valuing and marking might become somewhat onerous, and the necessary protection against fraud or intentional neglect, which is afforded by the intimate acquaintance of the members one with another, would be wanting.

One objection to the small area covered by a society is that in the event of great mortality, such as an epidemic of contagious disease, it may be unable to afford help when it is most needed. It might be desirable to provide for such a contingency by a rule to the effect that if the demands on the funds owing to an epidemic exceed the total amount of the funds in hand, the proportion of compensation payable may be reduced. Many clubs provide for a levy on all the members equally in the event of the funds being insufficient. The objections connected with the limited sphere of operation could be removed by re-insurance, but though this is common on the Continent it has not up to the present been done in this country.

Compensation.—In the case of cow clubs, compensation is frequently paid at the rate of three-fourths of the full value, but in some the value is allowed up to, but not exceeding £10, with a lower limit for calves. In the case of pigs it is not uncommon to pay the full amount at which the pig is valued. On some grounds it would seem desirable that something less than the full value should be paid.

The valuation is usually made by a committee immediately on the illness of the animals being reported by the owner. On the Continent, however, animals are frequently valued on entry into the society.

Compensation in the Event of Compulsory Slaughter.—In the event of the compulsory slaughter by order of the local authority of any animals insured in the society, the compensation payable by the society would only be the difference, if any, between the sum for which the society was liable in case of death and the amount actually paid by the local authority.

It is therefore to the advantage of the club to see that its members report the suspected existence of any contagious disease which is dealt with by the local authority, especially swine-fever, to the local police so as to obtain compensation and avoid the whole loss falling on the funds of the society.

This should be provided for in the rules, and it might with advantage be laid down that no compensation should be paid for loss in the event of a member failing to report a case of contagious disease to the local authority.

Employment of a Veterinary Surgeon.—Some clubs undertake to pay the fees of a veterinary surgeon called in to attend on sick animals, provided the necessary authority is first obtained from the committee of the society. It would probably be convenient to arrange with a veterinary surgeon to attend in such cases at a fixed fee.

Precautions in Cases of Contagious Disease.—When an animal is taken ill, it is usual for certain members of the society to inspect and value it, but should the disease be of a contagious nature there is a great risk that it may be unintentionally spread in this way. It is very important, therefore, that members thus employed should take the precaution of thoroughly disinfecting themselves upon leaving the cow shed or pig sty where the ailing animal is housed. They should wash their hands with soap and water, and their boots with a solution of carbolic acid or with some other suitable disinfectant. In the case of pigs, this is, owing to the possibility of the disease being swine-fever, especially necessary.

Should the existence of swine-fever be suspected, the owner should give notice of the fact with all practicable speed to a police constable in order that the provisions of the Swine-Fever Order of 1908 may be put into operation. It is also of importance that before entering a sty for the purpose of carrying out their inspection the members of the committee should ascertain whether or not the provisions of Article 2 of that Order are already in operation, as to enter an infected place, in which a diseased or suspected pig is, or has recently been kept, would be an offence under the Diseases of Animals Act, 1894.

Method of Raising Funds.—There is commonly an entrance fee and a fixed annual subscription for each animal, in addition

to a charge for inspection and marking on entry. This system has the advantage of simplicity, but it is open to the objection, particularly in the case of cows and horses, that the owner of a high-priced animal pays no more than the owner of one of less value, though in the event of loss he would receive considerably more from the society's funds. This objection could be removed by the valuation of each animal on entry into the society, and its annual revaluation, with the adoption of a scale of premiums proportionate to the value. On the Continent this system is frequently adopted, and in the event of the accumulation of a large reserve fund the premiums are reduced. From the experience of a large number of societies in Bavaria, insuring in all over half-a-million animals, chiefly cattle, a premium of $1\frac{1}{2}$ per cent. of the insured value, or 3s. for every £10, has proved on the average sufficient.

Reserve Funds.—The Friendly Societies Act requires registered societies to make provision in their rules for the investment of their funds, and it is desirable that the rules of unregistered societies should specify in the same way that funds not wanted for immediate use, or to meet the usual accruing liabilities, shall be invested by the trustees as the Committee may direct, in the Post Office Savings Bank or in any savings bank certified under the Act of 1863, or with the Commissioners for the reduction of the National Debt, or upon Government or real securities in Great Britain or Ireland. The trustees or treasurers of registered societies may invest any sum of money, the property of the society, without restriction as to the amount, in any savings bank willing to receive their deposits.

The accumulation of a substantial reserve fund is undoubtedly desirable as a protection in the event of an epidemic of disease occurring in the neighbourhood, but it is very necessary that suitable provision should be made in the rules for the auditing of accounts, inspection of books, &c. In this connection it may be observed that the registration of a society ensures the proper keeping of the books, as a balance sheet, called the Annual Return, duly audited and signed by the Secretary and Treasurer, has to be sent each year to the Registrar.

The only criminal remedy against fraud by its members open to an unregistered society is confined to cases of larceny

or embezzlement, but a registered society has a remedy on summary conviction against any person who obtains possession of any of its property by false pretences or who withholds or misapplies it.

Cow Clubs.

The following is a description of a society, which may be taken as fairly typical of the method of conducting an ordinary cow club.

The society consists of officers and an unlimited number of members, the officers being the president, vice-president, secretary, treasurer, marker and a valuing committee of three members. The duty of the president is "to keep order during meeting hours, impose fines and see justice done between each member and the Society"; the marker brands each cow entered on the horn, or, if the animal be hornless, on the right foot; and the function of the valuing committee is to determine the value in case of illness or death of a cow.

The society does not retain the services of any particular veterinary surgeon, and the members can employ whom they please. If a member's cow fall ill, the owner is to report at once to the Secretary, who forthwith advises the valuing committee, all of whom—or at least two of the three—go to see the cow as soon as possible. As soon as the committee has appraised the cow and seen its condition it becomes the property of the society, and the committee can order its slaughter or can otherwise dispose of it. The full value of the cow as a healthy animal is fixed, and of this sum the owner receives 75 per cent., or 15s. in the £, the cheque on the society's banking account being drawn by the president, secretary and treasurer. The secretary receives a small salary for his work.

Any person wishing to become a member of the Society must be proposed at a quarterly meeting. The entrance fee is 2s. 6d. for the first cow and 1s. for each subsequent cow. The subscription is 6s. per annum for each cow and is payable in monthly instalments; the cost of marking is 6d. per cow. Hence, after the first year the cost of insuring three cows would be 18s., irrespective of the value of the cows. A member on entering a cow and describing its age and colour, pays the

entrance fee and subscription, and forthwith becomes entitled to the benefits of the club. Promptness in payment of subscriptions is insisted upon under penalty of forfeiting all advantages.

The majority of the members have from one to two cows, while some have three or four and even six cows insured.

About 3 per cent. on the average of the insured cows die during the year, milk fever being the principal cause of death.

This society is stated to have made one mistake which was soon remedied. Any sort of cow was at first admitted, with the result that the society was imposed upon by a few persons who bought and entered old cows of little value and claimed average value at death. This practice was effectually stopped by the adoption of a new rule to the effect that no cow would be accepted for insurance which had had more than two calves. Again, if the marker has cause to suspect that any cow required to be marked by him is unsound or diseased, he is not allowed to mark such cow without the concurrence of the valuing committee; and as the marker is a practical man and himself a cowkeeper, the society is sufficiently protected. If a member lose a cow or cows from any contagious disease, he is not allowed to enter another until the cow shed and adjoining buildings have been thoroughly disinfected.

In some societies the full value of the cow is paid so long as it does not exceed £10, and the subscription is 1s. a quarter with 1s. entrance fee. The subscription for calves is 9d. a quarter and 6d. entrance fee, the compensation payable varying from £2 to £5. The number of animals belonging to any one member is sometimes limited by rule so as not to exceed seven, of which two must be calves.

The value of these societies to small cowkeepers is shown by the fact that in one society one unlucky occupier of less than eight acres of land has received payment within a comparatively short time for four cows; another small farmer, for three cows; while a third had on one occasion two cows killed by lightning. The secretary of one of the largest of these societies states that the members are in all cases small holders, and he observes that "among such holders the benefits of a society such as this are of the greatest—in fact, without some system of insurance small holders cannot exist, the loss of a cow being most serious to the man whose capital is but small."

Pig Clubs.

Pig clubs are run on somewhat similar lines, but they are usually composed almost entirely of cottagers and allotment holders. Some of them limit the number of pigs which may be insured by a single member to three or four.

The entrance fee frequently is 1s. for each pig, sometimes 1s. in the £ on its value, and sometimes a fixed amount, such as 1s. 6d. per member. The subscription for each pig varies from 1d. or $\frac{1}{2}$ d. per week, 3d. a month, or 6d. a quarter. An extra charge, usually about double, is made for insuring boar pigs or breeding sows, while sucking pigs are not admissible. The pig is marked on the ear, and the marker receives a few pence for his trouble. In case of illness the owner has to inform the secretary, and a valuing committee inspect and value the animal. The proportion of value allowed to the members varies; in some clubs it is 15s. in the £, in others 17s. 6d., and in others the full value is paid. A few clubs pay less for high-priced pigs, thus 18s. is paid for a pig worth £1, £1 15s. 9d. for a pig worth £2 and a smaller proportion for each additional £. The committee may, if they wish, dispose of the pig on behalf of the club.

The reserve funds naturally vary very greatly. Many clubs have funds up to £100-£150, but £20 to £30 is often considered a sufficient reserve fund for clubs with 40 or 50 members, and occasionally further profits are divided up annually after the manner of dividing clubs. Although the societies are formed for and rely entirely on mutual help, their income is frequently augmented to a small extent by subscriptions from honorary members.

CO-OPERATION FOR SMALL HOLDERS.

The following paper on Co-operation was read by Mr. E. J. Cheney, one of the Small Holdings Commissioners, at the Conference of Representatives of Local Authorities convened by the President of the Board of Agriculture and Fisheries, and held in London on Wednesday, 7th October, 1908:—

“ I am honoured by being asked to introduce the subject of co-operation to your notice this afternoon, and, having regard

to the limited time at our disposal and to the impossibility of dealing adequately with a subject of such importance in the course of a few brief remarks, I propose to omit the usual statistics and references to the progress which co-operation has made on the continent of Europe, and to confine my observations to a few salient facts in regard to co-operation as it affects the small holdings movement.

" Before proceeding further, I should like to emphasise the fact, to which the President referred at a meeting at Norwich on Saturday last, that there are two separate and distinct branches of the farming, market gardening and fruit-growing industries :—(1) The productive ; (2) the distributive.

" At the present time the grower or producer attempts to deal with both branches of this business himself, and fails entirely to realise that they are very much more separate and distinct than he is disposed to imagine. The first requires an agricultural training, and the second a business or commercial training. I fear the large majority of the farmers of this country do not appreciate in the least what a very distinct line of demarcation there is between the two, and, however well qualified they may be with regard to the productive side, they have a very great deal indeed to learn with regard to the distributive side. The truth of this must be patent to everyone, if it is considered what a wide commercial knowledge and experience is required before a man is considered competent to conduct a large merchant's or trader's business with any prospect of success, and yet the farmer, with no commercial knowledge at all in the strict sense of the term, considers that he can compete on equal terms with men who are head and shoulders above him in their knowledge and experience of their own particular branch of trade.

" Now, the only way in which farmers can get over this difficulty is by forming themselves into powerful agricultural co-operative societies, and by employing a staff of expert managers to look after the trading side of their business. This has been done with great success in Norfolk and Suffolk, where a large society exists, managed by an elected committee of thirty of the leading agriculturists of the two counties in conjunction with a competent staff of experts. By this means the two branches of the farmer's business are combined.

" Now, if it is necessary for the large farmers to combine

in order that their business may be conducted to the best advantage, how much more is it necessary that the small holders should do so, and so be in a position to buy their requirements and market their produce on the best terms possible ? The small man will be too busy to attend markets or to study them, all his time will be occupied in tending his crops and his stock, marketing must be left more or less to chance, a few flooded markets may cause his ruin, and unless the small men will form themselves into local societies the development of the small holdings movement will be hampered very seriously indeed.

"To my mind, and I do not speak without experience, the co-operative movement should be developed upon the following lines :—

"Firstly, there should be one large society for a county or group of counties ;

"Secondly, there should be small local societies, affiliated to the large one ; and

"Thirdly, there should be a central bureau or intelligence department, where the managers and representatives of the large societies could meet to discuss questions of policy and of contracts, and to organise an interchange of trade and the marketing of produce.

"An attempt is being made at the present time to promote joint action between the agricultural co-operative organisations of England, Scotland and Ireland, and if the fact is realised and accepted that the central body must not be a trading body, but a central bureau or intelligence department, it will be of the greatest assistance possible, and will help considerably the agricultural co-operative movement generally. It could be run, too, without imposing any tax, either openly or otherwise, on the trade of the societies affiliated to it.

"Under a system of the kind the small man would be placed on equal terms for trading purposes with the largest farmer in the country.

"To illustrate what I mean, the large society to which I have referred, admits small societies to membership on the basis of one 5s. share for every ten members ; one-quarter of the share capital has been called up, which means that the cost of affiliation to the large society costs the small society 1½d.

per member, and for this the small society is admitted to full membership. The large society can supply anything from a tintack to a steam engine, and the purchase of coal may be taken as an example of the advantages which a small man would derive from joining it. This society makes contracts direct with the colliery for from 5,000 to 10,000 tons of coal at a time, and if the small society could take one or two trucks, it would obtain them at a price which might mean a saving of from 5s. to 7s. 6d. a ton on the cost at which its members could obtain coal in small lots locally. The small society could also obtain the best seeds, the best cake and feeding stuffs, and the best artificial manure and other requirements at the lowest price possible.

"Then with regard to the marketing of produce and stock. Take the pig trade by way of illustration. The farmers of Suffolk are very large pig breeders, and the usual practice was to send the pigs to the local markets. This method answered very well when the markets were not glutted, but when they were the results were disastrous ; another drawback was that the pig markets were in the hands of a ring who controlled the prices to their own advantage. To get over this difficulty the society decided to have their own expert, a man who is in touch with all the important markets throughout the country. Between £60,000 and £70,000 worth of pigs passed through his hands last year. The effect of this arrangement is that the pig ring has been broken, flooded markets are avoided, and members can rely on obtaining the highest market price of the day.

"Now there is no reason whatever why this system should not be multiplied indefinitely, and applied to the disposal of fruit, vegetables, and the like. I came across a case only last week where a man sent 1 ton of apples and garden stuff to London and received in return a postal order for 2s. ; that kind of thing is a matter of common occurrence, and unless steps are taken to organise the producers and to insure as far as is practicable that they shall reap a fair and proper return for their labour of months, I am afraid it will go very badly indeed with them. Then again produce must be sent to the consumer in the best condition possible ; almost everything pays for careful grading, and this, as a rule, could best be done by the experts of the

large society of the district. I cannot refer further this afternoon to this most important question, but I hope I have said enough to cause you to realise how absolutely vital organisation is to the success of your tenants and how necessary it is to encourage it in every possible way.

"I will now make a few remarks on the subject of land renting associations, which will be as a rule trading bodies as well.

"When the Small Holdings Act came into operation there was a great rush to form associations, but unfortunately many of them were formed under a misconception of the amount of share capital that would be required. Some of the promoters seemed to imagine that twenty men, for example, had only to form themselves into a registered association, with a capital of say, £50, and to apply to a county council for 200 acres of land, and they were bound to get it.

"The question of capital has received the careful and serious attention of the Board, who have come to the conclusion that councils are justified in letting land to an association, provided its nominal share capital, called and uncalled, is equal to three years' rent of the land applied for, it being thought that this amount of share capital, which is a separate and distinct matter from the amount of capital required to farm the land properly, will impose a sufficient liability upon the members of the Association to furnish a guarantee that they will not admit unsuitable persons to membership. When associations are prepared to pay six months' rent in advance, or can provide an outside guarantee, of which the council can approve, that the rent will be paid when it becomes due, a lesser amount of share capital may be considered as being sufficient, but to my mind the first is far and away the best system to adopt, and I am pleased to be able to state that two important societies have been started under it already, one at Mere in Wiltshire, which takes possession of 452 acres of land this Michaelmas, and the other at Biggleswade in Bedford, to which land has been let to the extent of 280 acres, also from this Michaelmas. The importance of societies of this kind cannot be overestimated, since their success depends on mutual responsibility, which paves the way to credit banking and other important branches of the co-operative movement.

"The gain to a county council from letting land to an associa-

tion is also considerable. Only one rent would have to be collected instead of say twenty to thirty, and the committee of the association would select the tenants and be answerable for the proper cultivation of the land. The gain to the members of the association would also be great, mainly because of the help which it would be to them in their farming operations. An association could invest a portion of its capital in some of the heavier farm implements, such as Cambridge rolls, drills, and the like. There is indeed no limit to what can be done by self-help and co-operation.

"There is another most important factor to consider in connection with the movement, namely, the position of the industrial or distribution societies in relation to it. The turnover of these societies runs into millions, the Leeds society alone deals with produce which it would take from 60,000 to 70,000 acres to grow, not counting beef, mutton, milk, poultry and eggs.

"I much regret to find that societies of the kind have not shown any serious indication at present of either applying for land or of a desire to establish their members upon it. In my humble judgment, schemes of the kind would be bound to succeed owing to the ready market which the industrial societies have at their command, and even supposing that the astute business men at the head of the industrial co-operative movement cannot see their way to recommend their members to embark in the cultivation of land, I would impress upon them the desirability of forging a bond of union between the agricultural and industrial branches of the movement, whereby the organised producer of the country is brought into direct touch with the organised consumer of the town.

"There is only one other matter in connection with co-operation to which I will refer : it is the very important one of mutual live stock insurance. In view of the conditions under which the small holder will farm, it is essential to his success that he should run as few risks as possible, and to that end he must be placed in a position to insure his crops and his stock. He would find no difficulty in covering them against fire or against hail, but he would find considerable difficulty at the present time in protecting himself against other risks at anything like a reasonable rate. The death of a horse, a cow, a fat pig and the like would be a very serious matter indeed to the small man, and

might mean the loss of a considerable portion of his income for the year.

"A co-operative insurance society is about to be started in London. I would urge upon the promoters the extreme desirability of putting the insurance of stock before that of fire, and of placing means at the disposal of the small men by which they could extricate themselves from the serious financial difficulty in which the loss of stock would involve them.

"Before sitting down I wish to make a brief reference to another important subject, namely, that of agricultural education. If the small holdings movement is to succeed in the way it can and ought to do, education and co-operation must go hand in hand, and the movement opens up a splendid field of usefulness to your technical instruction committees.

"I venture to think that the necessity for providing scientific and practical instruction in agriculture has never been more pressing, and I suggest that special efforts should be made to apply the results of scientific research in a practical and business-like way.

"No one realises more than I do the value of scientific knowledge, but what I feel strongly is that the time has come when the results of research should be applied in a practical way, when the knowledge obtained at Rothamsted, at Woburn, and other stations of the kind, should be brought directly to the door of the small man.

"Experimental plots are necessary, no doubt, for students at the universities, agricultural colleges, and agricultural institutes, but to the small man they are almost valueless.

"I should like to see county councils taking an allotment or small holding in every district under their own direction and control by arrangement with the tenant, and applying to the cultivation of that holding the most approved methods of scientific cultivation; seeing is believing, and if the small men of a district saw an allotment in their midst yielding better monetary results when treated and cultivated in the light of scientific knowledge, the value to them would be almost incalculable, and would be the means, not only of putting money into their pockets, but of raising the standard of intelligence throughout the countryside and of adding to the interest and charm of the cultivation of land—than which no more interesting occupation is possible."

AGRICULTURE IN ARGENTINA.

The Board of Agriculture and Fisheries have received, through the Foreign Office, the following report on agriculture in Argentina, which has been prepared by Mr. Hugh M. Mallet, British Consul at Rosario.

The provinces pertaining to the Rosario Consular district are those of Santa Fé, Córdoba, Entre-Ríos and Corrientes, and owing to its geographical position, Rosario has become the centre of the grain trade of the Argentine Republic. The principal ports for the shipment of grain are Rosario, Colastiné (Santa Fé), Paraná, Villa Constitucion, and San Nicolas (Province of Buenos Ayres), all situated on the River Paraná, but Rosario, owing to its situation, port facilities, and railway communication with the provinces, is the most important.

A succession of bountiful harvests of the crops on which this district of the Argentine so largely depends, together with the good price obtained for grain, have resulted in a period of exceptional prosperity among both farmers and merchants. The price of land and rents have consequently considerably increased, and this has led to the removal of live stock to cheaper lands in outside districts.

Principal Crops.—Wheat, maize, linseed, lucerne (hay) and potatoes are the favourite crops, barley, oats and mani (peanuts) receiving minor attention.

Cost of growing Wheat.—The following is a fair estimate of the cost of production of this cereal :—

Cost of preparing one acre of land for wheat—

		<i>s.</i>	<i>d.</i>
Ploughing	...	1	9½
Harrowing	...	0	6½
Sundries	...	0	2
		<hr/>	<hr/>
		2	6

	<i>Sowing.</i>		<i>s.</i>	<i>d.</i>
Labour and animals	0	2½
Seed (53 lbs. at 6s. 3d. per cwt.)	2	11½
Harrowing	0	7½
Rolling, &c.	0	8½
Sundries	0	1½
			<hr/>	<hr/>
			4	7½

	<i>Harvesting.</i>		<i>s.</i>	<i>d.</i>
Machinist, stacker and assistant, cartage, loading, food, horses, oil, grease, &c.	2	10

	<i>Threshing.</i>				
					£ s. d.
At 3 <i>½</i> per cwt.	0	6	0		
Sacks	0	2	1 <i>½</i>		
Cartage to railway station	0	1	1 <i>¾</i>		
General expenses—					
Maintenance of labourers	0	7	1		
Land tax	0	0	6		
Depreciation of materials, 15 per cent. ...	0	2	1 <i>½</i>		
10 per cent. interest on capital ...	0	4	1 <i>½</i>		
Interest on cost of tools	0	1	5		
„ circulating capital, &c. ...	0	1	7 <i>½</i>		
					1 8 7 <i>½</i>

The total cost of growing 1 acre of wheat is therefore £1 18s. 7d. and profit to farmers per acre sown is about 17s. 1*½*d. This profit is increased where the farmer has a family to assist in the work and so reduce labour, the expense of which is sometimes very high. Experience shows that 25 acres of wheat can be harvested in a day.

Nationality of Grain Producers.—Farmers seldom cultivate less than 250 acres with wheat, and it is as well to mention that although the profit on grain growing, as shown by the foregoing table, is satisfactory, up to the present the Northern European has taken little interest in wheat-growing in the Argentine, and it is doubtful if he could successfully compete against the Southern Europeans, principally Italians and Spaniards, who find surroundings and climate so similar to those of their own countries.

Method of Grain Culture.—Owing to the primitive and somewhat careless way in which land is cultivated, the crop yields are not nearly so large as they would be were more attention bestowed on ploughing, selection of seed, &c. Hitherto the grain farmer has looked rather to obtaining quantity than quality, but as the cost of renting land increases, better methods are gradually being adopted.

The wheat grower rents, as a rule, from 100 to 800 squares of land (one square equals a little over 4 acres), reserving a few squares for pasture and linseed. The latter crop is sown with a view to guarding against losses in the event of a poor wheat harvest, and with a favourable yield, gives excellent results.

Linseed Culture.—Only the well-to-do farmer can afford to cultivate linseed on a large scale, as not only does its production

require a much larger capital than wheat or maize, but it is looked on as a risky crop, as it is so easily affected by both drought and frost. The straw of the flax plant is not at present dealt with as flax, but is often used as fuel for the threshing engine.

Renting of Land.—Land can be rented at from £1 1s. to £4 7s. per square of about 4 acres, according to district and situation. Land near to a railway is the most sought after, as it saves the heavy expense of cartage over roads which, after a spell of bad weather, are often almost impassable. It is also easy to purchase land, but prices vary greatly according to situation.

Another method for those who have not the capital to pay rent in advance, as is customary, is to contract with a large land owner to take up land on the basis of paying in produce, and in these cases from 12 to 25 per cent. of the crop, according to circumstances and situation of land, is the rent, the tenant meeting all expenses of maintenance, seed, &c.

Farmers' Risks.—The principal risks grain farmers have to encounter are from drought, hail and frost. Locusts also cause some damage, but of late years, with the methods adopted by the Government to destroy them, at least in the more populated districts, the damage has been much less than that caused by drought.

Labour.—The large harvest of the past year created a demand for labour, and, in consequence, wages increased to an unusually high rate. Machinists have earned from 14s. to 17s. 6d. per day with all found, and labourers from 7s. to 12s. 3d. per day with all found, including wine. There have been no strikes of late, and, owing to the good demand for labour and the wages paid, there is no sign at present of discontent among the working classes.

Machinery and Implements.—The demand for machinery is important and promises to increase. One of the more important firms established at Rosario sold 160 threshing machines, with appliances, during the last six months of the year 1907. North America and Germany are our principal competitors in supplying agricultural machinery and implements, and manufacturers' agents from those countries frequently visit Argentina in order to gain a better knowledge of its

requirements. Preference is still given to British agricultural machinery of the heavier kinds ; as regards ploughs, harrows and the lighter class of implements we have strong competitors. United States manufacturers are now providing duplicate pieces to replace those parts of machines, &c., that are more liable to become broken, and farmers are giving preference to such makes, as it prevents any stoppage of work during harvest. A number of threshers and binders imported from Australia are reported to be giving satisfaction.

Grain Sheds required.—Notwithstanding the serious losses farmers frequently experience from wet weather at harvest time, few only will incur the expense of constructing sheds for storing purposes. The method is to take all risks and sell grain, which is delivered at the railway station, as soon as threshed. The result is that the railway sheds become blocked and large quantities of grain are deposited, exposed to weather, awaiting railway transport. This is the principal cause of grain being shipped on vessels in damp condition.

The sale of so large a quantity of grain within so short a space of time must also influence prices, and it is frequently noticeable that as soon as produce has been sold by the farmer, prices rise. It would decidedly pay farmers to construct deposits to store their grain, and it is certain that sooner or later they must do so.

Tarpaulins and large canvas sheets are much used as coverings to protect the bags of grain from weather, and consequently there is a very good sale for these.

Milling.—Local enterprise has caused a number of important mills with modern machinery and lighted by electricity to be erected within the principal grain zones of Santa Fé and Córdoba. An excellent class of flour and other materials for home consumption is supplied by these mills. At the present time, in the province of Santa Fé only, a tax exists, imposed by the Provincial Government, of 12 c. paper currency on each bag of flour produced.

Important influences are, however, being brought to bear to secure the abolition of the tax, and with probability of success, as it is recognised that it is injuring the milling industry and causing new mills to be established in other provinces where there is no tax.

Lucerne.—Lucerne is cultivated on a large scale for fodder,

serving the purposes of hay. This plant, which grows luxuriantly, can be cut at least four times during the year. A considerable quantity is dried, pressed and baled for export, principally to Brazil.

Timber.—Some parts of the Provinces are well wooded with a variety of large trees, but owing to the high cost of labour and of transport it does not pay to cut and prepare lumber. It is found cheaper to import timber from Canada and North America. Quebracho wood, from which a tanning material is prepared, is, however, a profitable and increasing trade.

Agricultural Schools.—The Provincial Governments of Santa Fé and Córdoba have under consideration a project for establishing agricultural schools and giving prizes with the object of stimulating the production of a better class of grain and improving the breed of live stock. The Federal Government is to be asked to support the scheme.

Live Stock.—In the northern and western parts of the province of Santa Fé, and also in Córdoba, Entre-Ríos and Corrientes, large districts are devoted to the rearing of cattle, horses, mules and goats, with profitable results. Sheep farming is also profitable, but the favourite district for sheep raising is in the southern part of the Republic.

Purchases of imported live stock, consisting principally of bulls, heifers, rams, pigs and also poultry, have been important for several years past. Farmers usually make their purchases of imported stock through agents in Buenos Ayres who are in direct touch with importers. In the same way the sale of animals for export and for freezing purposes is mostly done through agents having their head offices in Buenos Ayres, from which port the shipments are mostly made.

Pigs, Poultry and Dairying.—These branches are receiving more attention, but methods are still somewhat primitive, and supplies are insufficient to meet local requirements.

Agricultural Exhibition.—Under the direction of the *Sociedad Rural*, an important and useful society with nearly 1,000 members, an exhibition is held annually in August, consisting of live stock, agricultural machinery and implements for farming purposes. With the Government's assistance, a considerable expenditure has been incurred in arranging suitable premises for this object, and prizes are awarded to successful exhibitors.

Sales of live stock at last year's show exceeded half a million dollars, and promise to increase as farmers get to recognise its importance. Both native and foreign exhibits are admitted. Last year's exhibition was favoured by a visit of the President of the Republic accompanied by his Ministers, several members of the Diplomatic Corps and other distinguished visitors, who complimented the organisers on their successful undertaking.

The area sown with cereals in 1907 was as follows :—

Province.	Wheat.	Linseed.	Maize.
	Acres.	Acres.	Acres.
Santa Fé	3,260,030	1,543,997	1,884,610
Córdoba	3,535,958	431,684	506,350
Entre-Ríos	718,278	511,043	301,340
Other provinces ...	6,706,853	950,199	4,055,835
Total	14,227,168	3,436,923	6,744,335

The estimated total production in this area was :—Wheat, 4,800,000 tons ; linseed, 1,100,000 tons ; maize, 3,800,000 tons.

Export of Cereals.—The export of cereals from ports on the River Paraná of this Consular district and other ports of the Argentine from 1st January to the 18th June, 1908, according to figures published by *The Review of the River Plate*, was as follows :—

—	Wheat.	Maize.	Linseed.
	Tons of 2,204 lb.	Tons of 2,204 lb.	Tons of 2,204 lb.
Rosario	814,831	349,114	248,213
Villa Constitucion	5,670	34,632	19,043
Santa Fé (Colastine)	147,854	—	86,160
Other river ports	63,170	92,000	150,000
All other ports of the country ...	1,732,507	164,179	244,308
Total	2,764,032	639,925	747,724

The estimated quantity available for export during 1908 from the entire country is—wheat, 3,600,000 tons ; maize, 2,800,000 tons ; linseed, 1,100,000 tons.

The maize crop in some districts suffered from want of rain, and the yield of this crop is, therefore, not nearly so large as was promised, but, on the whole, the quantity for shipment

from the entire country will considerably exceed last year's shipment.

The value of cereal crops for export during the year 1908 from the entire country is estimated at :—Wheat, £25,100,000 ; maize, £12,200,000 ; linseed, £10,100,000 ; total, £47,400,000.

The official estimate of the number of live stock for the year 1907 is as follows :—

Province.	Cattle.	Sheep.	Horses.	Mules and Asses.	Goats.	Pigs.
Santa Fé	2,500,000	1,800,000	415,000	—	—	2,000,000
Córdoba	2,500,000	2,800,000	430,000	120,000	850,000	100,000
Entre-Ríos	3,000,000	5,390,000	590,000	12,300	24,000	40,000
Corrientes	6,000,000	1,400,000	425,000	25,000	35,000	26,000
Other provinces	11,800,000	66,160,000	3,600,000	387,700	1,657,800	675,700
Total	25,800,000	77,550,000	5,460,000	545,000	2,566,800	2,841,700

The agricultural and pastoral resources of this country with its extensive territory and variety of climate are immense, and, as the population increases, reducing the cost of labour, it promises to become one of the principal food supplying countries of the world. Cotton, vines, rice, coffee, fruits, and many other products must eventually receive more attention.

“CORKY SCAB” OF POTATOES.

(*Spongopora scabies*, Mass.)

The parasite producing “corky scab” in potatoes, for many years considered as a fungus, is now known to be a member of the numerically small but cosmopolitan group of organisms known as the Myxogastres.

The history of this group is interesting. In 1833 it was called Myxogastres by Fries, and was included in the fungal family Gasteromycetes on account of the superficial resemblance, during the fruiting condition, to the puffballs. In 1836 Wallroth suggested a new name—Myxomycetes, which was generally accepted for some time. Finally, in 1858, De Bary proposed the name Mycetozoa. His reason for this was the discovery that

the spores on germination, instead of producing a germ-tube, give origin to amoeboid bodies or swarm-spores, which coalesce to form a plasmodium. This discovery was considered to place the Myxogastres outside the pale of the vegetable kingdom, and an affinity with the sponges has been suggested. As a matter of fact, they are still retained amongst Cryptogams, and either included in the fungi, or considered as a satellite of that group, by the latest exponents of classification based on natural affinities.

Most of the species are minute, and the majority are saprophytes. To this statement, however, there are two marked exceptions : *Plasmodiophora brassicæ*, Woronin, the cause of "club-root" or "finger-and-toe" in cruciferous plants, and *Spongopora scabies*, Mass., the parasite under consideration.

The organism causing corky scab was observed by Berkeley in 1846, during an investigation of the potato murrain caused by the fungus now called *Phytophthora infestans*, De Bary. It was not described at the time, but two figures of the spore-balls were given, along with the following note :—"It appears to me to belong to the genus *Tuburcinia*, Fries. The spores have usually one or more cavities in the surface communicating with the interior cavity. They may, therefore, be considered rather as compound bodies consisting of a quantity of cells arranged in the form of a hollow ball. This view of their structure requires more attention than I am able to give it at present."

In 1850 Berkeley gave a technical description of the organism under the name of *Tuburcinia scabies*, remarking that it was very common on potatoes.

Judging from the mass of spores joined together to form a spore-ball, Berkeley placed his new species in the genus *Tuburcinia*, which, along with *Thecaphora*, *Sorosporium*, &c., presenting a similar structure, is included in the *Ustilaginaceæ* or "smuts."

In 1877 Fischer de Waldheim published a revision of the *Ustilaginaceæ*, and advanced reasons for placing Berkeley's *Tuburcinia scabies*, in the allied genus *Sorosporium*, hence the parasite became afterwards known as *Sorosporium scabies*, Fisch. de Waldh.

In 1886 a Norwegian botanist, Brunchorst, investigated a

potato scab, at the time very prevalent in Norway, but, failing to connect it with Berkeley's species, and considering it to be an unknown form, described it under the name *Spongospora solani*. Brunchorst added considerably to our knowledge of the organism under consideration in clearly indicating that it was in reality a member of the Myxogastres or Mycetozoa.

Finally, Professor Johnson, of Dublin, discovered that "corky scab" was rampant in the west of Ireland, and has made many important observations respecting the cytology and general life-history of *Spongospora*.

From this brief account it will be seen that the organism under consideration should now be known as *Spongospora scabies*.

Appearance of Diseased Potatoes.—"Scab" is the popular term covering the general appearance of diseased tubers, but, unfortunately the name "scab" is applied by the potato grower to several diseases which differ very materially in origin. One form of scab, very prevalent on potatoes grown in the neighbourhood of towns, is induced by the physical action of ashes on the growing tubers where night-soil mixed with ashes is used as manure. A second form is due to the attacks of eelworms on the surface of the tuber, while a third type is caused by the millipede *Julus pulchellus*. American scab is caused by *Oospora scabies*, Thaxt., a much reduced type of fungal life. All the above forms of scab shew a close superficial resemblance ; the surface of the tuber is more or less covered with quite shallow wounds, round the margins of which a copious formation of corky tissues is developed, and a rugged or scabbed appearance is produced. The disease known as "Black Scab," or more properly "Warty Disease" of potatoes, is entirely distinct from the above kinds of scab, and does not resemble them in appearance.

The scab induced by *Spongospora* has received the appropriate name of "corky scab" on account of the considerable development of wound-cork around the injured portions. In the early stage of the disease small, dark-coloured, and slightly raised patches appear on the surface of the tuber ; these, however, are not as a rule uniformly scattered over the entire surface, as in the forms of scab indicated above, but are more or less localised. When the vegetative phase has been com-

pleted and the formation of the spores has commenced, the skin of the raised blister is ruptured, and a dense mass of brownish or snuff-coloured spore-balls is exposed.

The further extension of the disease on a given tuber depends mainly on the relative abundance of moisture present in the soil, as has been proved by experiments made at Kew with diseased tubers submitted for investigation. When potatoes showing the disease in the stage indicated above are placed in comparatively dry soil, wound-cork is quickly formed immediately below the seat of injury, and the further development of the parasite is arrested. On the other hand, if slightly attacked tubers are placed in soil that is kept constantly wet, the formation of wound-cork is arrested, and the continuous development of the parasite is favoured in proportion. Large cavities from half an inch to an inch deep are thus formed owing to the vegetative portion of the parasite continually eating into the substance of the tuber, and the cavity so produced becomes filled with a dense powdery mass of spore-balls.

The presence of such masses of spore-balls suggests *Spongopora*, but, as in the case of every kind of scab, microscopic examination is absolutely necessary to ensure a correct determination of the specific nature of the disease.

Owing to the absence of a mycelium, those portions of a tuber not actually attacked by the parasite remain perfectly sound, consequently partially diseased potatoes, which are unsaleable, are frequently reserved for "sets." This is a dangerous practice, as the parasite in the plasmodium condition can remain in a passive state until the tuber commences to sprout, when it may resume active growth and so perpetuate the disease.

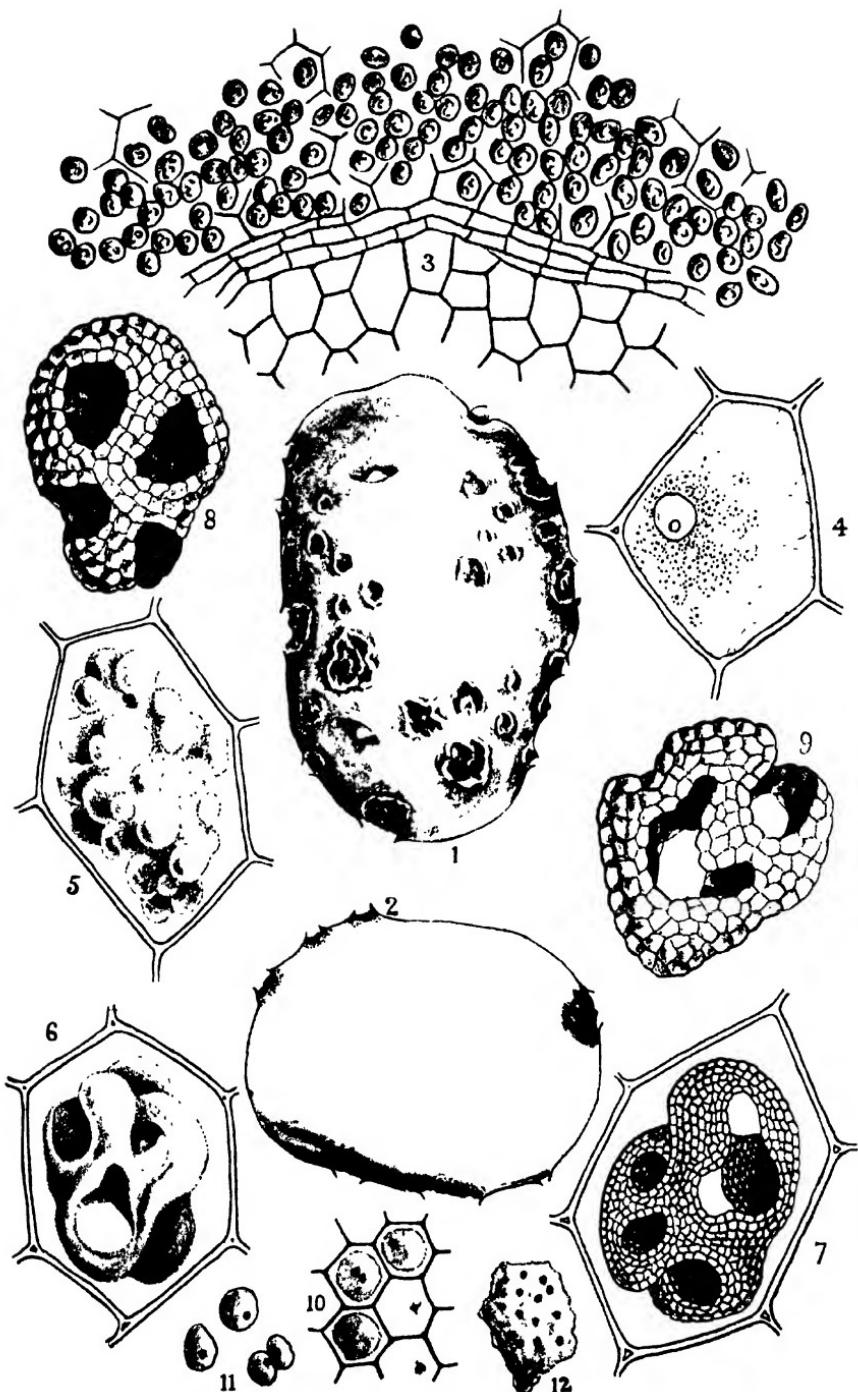
The spore-balls produced in the cavities of the tubers represent the ultimate phase of development of the parasite, and may be considered as the analogues of resting-spores in the fungi. They become liberated by the decay of the cells of the tuber in which they were originally formed, and may remain in the soil in a passive condition until the following season.

Morphology and Cytology.—If a section is taken through a scab where the vegetative condition of the parasite is still in active growth, many phases of its development may be studied. The earliest condition observed in a cell of the host consists of

a very few irregularly globose protoplasmic bodies, aggregated round the nucleus of the cell (Fig. 4). These bodies range from 3·5 to 4·5 μ^* in diameter, and for a certain period of time possess the power of spontaneous movement, slowly rotating on their axis or around the nucleus. When fixed and stained, these amoeboid bodies are seen to possess a single nucleus. Various stages of fission of the amoeboid bodies may be seen, preceded by the division of the nucleus into two daughter nuclei. How these amoeboid bodies gain an entrance into the cell of the host has not yet been observed, but such invaded cells are always the most internal of the cells affected by the parasite, and are always immediately adjoining other cells containing the organism in a more advanced stage of development. It seems probable that the organism, both in the plasmodial and also in the amoeboid condition, may be able to invade new cells by passing through the pits present in the cell wall. The unattacked cells of the potato are replete with starch grains, and contain shreds of protoplasm and a nucleus, which sometimes retains its normal form, but is usually more or less crushed and deformed by the pressure of the starch grains. It appears highly probable that the cells are invaded by the parasite for some time before the amoeboid bodies surrounding the nucleus can be seen, for when they are present the starch has as a rule disappeared from the cell. Stained sections support this view, as minute, irregularly-shaped masses of a protoplasmic nature, which stain deeply with a watery solution of Congo red, are present amongst the starch grains in cells bordering on the fringe of the obviously infected portion of the tuber. It may be mentioned here that a watery solution of Congo red has been found to differentiate very clearly the protoplasm of the parasite from that of the potato cell; the former becomes much more intensely coloured than the latter, and of a different shade. This may be due to a difference in functional activity and to the difference in age of the two kinds of protoplasm.

A second phase of development is reached when the amoeboid bodies, after repeated division, blend together to form a plasmodium, which at this stage nearly fills the cell in which it was formed (Fig. 5). This plasmodium presents an irregularly nodulous appearance, and for some hours slowly continues to change its form, the surface nodules gradually disappearing

* μ = micromillimetre or $\frac{1}{1000}$ millimetre.



"CORKY SCAB" OF POTATOES
(*Spongospora scabies*, Mass.)

at one point to appear at another. These changes are most marked at temperatures ranging between 60° and 66° F. Below 50° F. no movement can be seen, and if a section in damp air on a slide is placed for twelve hours on a block of ice, the plasmodium contracts very considerably and appears to be preparing to pass into an encysted condition. When such chilled sections are placed in water at a temperature of 65° F., the plasmodia slowly expand and assume their normal appearance. It is highly probable that the plasmodia in the scabbed potatoes become encysted during the winter months, and resume their activity when the potatoes commence to sprout, but at present there is no direct evidence on this point, as diseased potatoes have not yet been examined during the winter months. The substance of the plasmodium is very minutely granular and contains many quite small vacuoles. Numerous minute nuclei are also present.

In addition to the extension of the parasite from cell to cell in a tuber by means of amoeboid bodies, it also seems certain that the plasmodium in its early condition can migrate from cell to cell, and in some sections an appearance of the continuity of the plasmodium from one cell to another through pits in the cell wall has been observed. This method of migration appears to be followed in those instances where the parasite is extending for the purpose of passing into a resting stage, rather than when spore formation is the immediate object. A possible instance of this mode of migration was clearly seen where the plasmodium was passing from a diseased area into a young sprout.

The incidence of spore formation is indicated by the vacuolation of the plasmodium : at first a central very large vacuole is formed, round which the whole of the substance of the plasmodium is arranged in the form of a shell or crust, not more than 5 to 6 μ in thickness, then, owing to the continued increase in size of the central vacuole, the bounding wall is ruptured irregularly here and there, with the result that a hollow body is formed, more or less spherical in outline, with a varying number of irregular cavities in its wall. (Fig. 6). When this stage has been reached no further change of form takes place in the plasmodium ; the wall or crust of which becomes simultaneously differentiated into a series of cells,

one layer in thickness, generally hexagonal in optical section, and varying from $3\cdot5$ to $4\cdot5 \mu$ in diameter (Fig. 7). This structure is a spore-ball, which on arriving at maturity is liberated by the disintegration of the tissue of the host (Figs. 8 and 9). The spore-balls range in form from irregularly spherical to oblong or ovate, and vary from 40 to 50μ in diameter. In colour they are reddish brown in the mass and amber by transmitted light. The spore wall is sometimes tinged an olive-green colour.

Stained preparations of the mature cells formed from the plasmodium show a single nucleus in each cell. The contents escape intact, so far as has been observed in the Kew cultures, and are irregularly globose in form, with a few small projections. They show a very sluggish movement for some time, after which they become stationary, the nucleus then divides to form two daughter nuclei, and fission of the mass follows. A repetition of this process continues until a considerable quantity of amoeboid bodies are formed, which eventually coalesce to form a plasmodium. The diameter of the amoeboid body after its escape from the cell is about 3μ .

Professor Johnson considers that, in many instances at least, the single nucleus originally present in the cell undergoes division to form eight nuclei, and that eight swarm-spores eventually escape from the cell.

Geographical Distribution.—*Spongospora* is abundant, and has caused a serious amount of damage in Great Britain, Ireland, and Norway. It has been found in some quantity in Germany. It is highly probable that "corky scab" may be present in greater or less quantity wherever the potato is cultivated, and that it has been passed over as "scab" simply without any attempt to discriminate between the various forms of this disease.

Preventive Measures.—It is certain that the parasite remains in a diseased tuber in a passive state when conditions are unfavourable for active vegetative growth. Diseased tubers, therefore, should not be used for "sets," as the commencement of activity on the part of the parasite is regulated by the commencement of growth on the part of the potato, and a scabbed crop will probably result, in addition to the risk of infecting previously clean land, if diseased sets are employed.

According to Professor Johnson, practically all the potatoes in the west of Ireland are scabbed, and the planting of scabbed "sets" is unavoidable.

It may be stated that by soaking diseased potatoes for two hours in a solution consisting of half-a-pint of formalin in 15 gallons of water, the parasite located in the superficial cells of the potato is killed. It is very doubtful, however, whether a plasmodium lying somewhat deep in the tissue of the potato would be affected by this treatment. Under any circumstances it is a very risky and unwise practice to plant diseased "sets."

It has been definitely proved that the application of lime prevents the disease known as "club-root" or "finger-and-toe" in turnips and other cruciferous plants, and as the organism causing "corky scab" is very closely allied to the "club-root" parasite, it seems possible that the check for the one disease may prove to be a check for the other.

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Description of the Figures.

- Fig. 1.—Typical example of scab in early stage of development.
 - ,, 2.—Section of scabbed tuber in early stage of development.
 - ,, 3.—Section through a "scab" showing a mass of spore-balls, also the formation of wound-cork below the seat of injury.
 - ,, 4.—The earliest observed condition of the parasite, under the form of motile bodies, in a cell of the host.
 - ,, 5.—A later stage of the parasite, where the motile bodies shown in fig. 3 have coalesced to form a plasmodium.
 - ,, 6.—The stage following the condition shown in fig. 5; the protoplasm, owing to vacuolation, has assumed the appearance of an irregular hollow sphere with several large, irregular cavities in the wall.
 - ,, 7.—The stage following the appearance shown in fig. 6; the wall of the sphere has become resolved into a series of closely packed cells, one layer in thickness, forming a spore-ball.
 - ,, 8-9.—Two mature spore-balls that have become liberated, owing to disintegration of the cell-walls of the host.
 - ,, 10.—A few cells from a spore-ball. Three of the cells still contain their contents. Originally one nucleus is present in each cell. The contents have escaped from two of the cells.
 - ,, 11.—Escaped contents of cells, which are at first motile, and soon divide by fission.
 - ,, 12.—Nuclei in a small portion of plasmodium.
- (Figs. 1 & 2.—Natural size; the remainder highly magnified.)

POISONOUS FUNGI.*

I.—AMANITA PHALLOIDES, FR.

Of those British fungi which are known to be poisonous, one of the most dangerous is the subject of the present plate, *Amanita phalloides*. Both in Britain and on the Continent many cases of fungus poisoning have been caused by this species, and in not a few instances the results have proved fatal. In the United States also it is regarded as one of the most poisonous of all fungi.

The genus *Amanita* belongs to that section of the *Agraricaceae*, or gill-bearing fungi, in which the gills do not turn pink or purple, as in the true mushroom, but remain persistently white. It is distinguished from other genera of the section by the possession of both a basal volva and a ring on the stem. The volva is a cup-like structure attached to the base of the stem.

There are several species of *Amanita* found in Britain, and the one here figured is frequently met with during the autumn. In this species the cap (pileus) is viscid or slimy when moist, of a pale yellow or greenish colour, and 3 to 4 ins. across. The stem is white and smooth, solid at first, but becoming hollow with age; the base is bulbous, and the volva is usually well developed. The ring clothing the upper part of the stem is large and pendent. In the very early or "button" stage the whole of the pileus is enclosed within the volva; as the plant expands the volva is ruptured and the pileus bursts through, leaving the ragged edges of the volva attached to the base of the stem. Considerable variation is found in the way in which the volva is ruptured, and it frequently happens that portions of this structure remain on the top of the pileus. In this way the pileus becomes studded with irregular scales or warts.

Amanita phalloides usually occurs in woods, and on this account it is not likely to be confounded with the common mushroom. The colour of the pileus varies according to the amount of shade in the woods, being greenish or almost olive

* An article on an edible fungus—the Common Morel, *Morchella esculenta*, appeared in this *Journal*, September, 1908, p. 431.



POISONOUS FUNGUS
(Amanita phalloides, Fr.)

if the shade is very dense, and nearly white when growing in more open places.

The presence of a ring and a volva, together with the persistently white gills and pale yellow or greenish pileus are the more striking features of this fungus, and are sufficient to brand any specimen possessing them with the strongest suspicion. With regard to the volva care must be taken to obtain the entire stem, as the bulbous base together with the volva is often hidden by leaves or soil.

A large number of insect, fungus and other specimens have been received by the Board during the past few weeks, and the following are notes on a few of the specimens dealt with :—

**Notes on Insect,
Fungus and other
Pests.***

Beetle on Willows.—Specimens of beetles taken on osiers in South Petherton (Somerset) were identified as *Galerucella lineola*.

This species is sometimes, as in the instance under consideration, the cause of great loss in osier beds. The beetle lays eggs in the spring, and from these come grubs, which, when full grown, leave the osiers and pass into the soil, where they pupate, giving rise to the adult beetles which then return to the plants. In the summer, when the beetles are active on the osiers, spraying with Paris Green or arsenate of lead should be practised. The beetles hibernate during winter under rubbish, in crevices in the neighbourhood of the beds, under the rough bark of willow trees, &c. Over 50 have been taken crowded together in a piece of hollow stem only 3 in. long.

During winter an effort may be made to destroy the hibernating beetles, a good plan being to flood the osier beds, if practicable. Boards should be placed above the flooded area, and the beetles which collect on the under sides of the boards, should be regularly swept into a vessel containing paraffin.

Clover-seed Weevil.—Specimens of clover heads from Sharnbrook, Beds., were attacked by the grubs of the Clover-seed

* Notes on insect, fungus and other pests, dealing with the specimens submitted to the Board for identification, and their apparent prevalence, will appear in this *Journal* month by month. The notes commenced with the issue for June, 1907.

Weevil, *Apion*. Several species of these small pear-shaped weevils lay their eggs in the heads of clover. From the eggs tiny whitish grubs with brown heads and biting jaws are hatched. These grubs feed upon the developing seed, and when full-grown pupate in the clover blossom. There is more than one generation in the year. Once the grubs have got to work in the flowers they cannot be reached by any remedial treatment. The flower heads which are attacked may be recognised by the early browning and fading of the flowers and should be hand picked and burnt. Crops known to be infested may be mown early. The feeding off of infested plants in autumn by folding sheep on the leys is another measure recommended. Infested clover heads should be burned after threshing.

It often happens where there has been infestation that the clover is cut and stacked with many of the heads containing the *Apion* in the larval or pupal condition. The larvæ or pupæ develop into weevils, which may attack the new crop.

Ants in Houses, &c.—A case of small red ants occurring in a house in Carlisle was reported. These ants were *Monomorium pharaonis*, a species which is extremely troublesome in houses, bakeries and elsewhere. In such a case an endeavour should be made to find the ants' nest, which is likely to be situated under the floors or between walls in the neighbourhood of ovens, &c. If the nest be found, the colony can be destroyed by pouring carbon bisulphide into it. Owing to the poisonous nature of the fumes of carbon bisulphide the operator should be careful not to inhale them, and no light should be brought near the bisulphide.

Combating the ants individually is a tedious process. Advantage may be taken of their fondness for sweet things, lard, &c. Pieces of sponge cake, lard or fat, may be laid here and there, to attract the ants, which may then be destroyed by dropping the material used as a trap into boiling water. There is always risk of a new infestation, and it is well to extend the treatment beyond the spots chiefly infested.

Carnation Fly.—With further reference to the note on the Carnation Fly (*Hylemyia nigrescens*) which appeared in this *Journal*, January, 1908, it may be added that the maggots which hatch from the eggs deposited by this fly, tunnel between the upper and lower epidermis of the leaf, in

the same way as the celery fly, until they reach the stem, which they proceed to hollow out. A practice with some growers is to dissect the stem or leaf and remove the maggots with the aid of a long pin. The measures for preventing subsequent attack are described in the note above mentioned. Young carnations appear to be most attacked.

Cabbage Root Fly.—Specimens of Stocks from Nottingham were found to be attacked by the maggots of the Cabbage-root Fly (*Phorbia brassicæ*), which is dealt with in Leaflet No. 122.

Turnip Aphis.—Swedes from Rhondda (Glam.) were very badly infested with the Turnip Aphis (*Aphis rapæ*). Washes for use against aphides will be found in Leaflet No. 104 (*Aphides or Plant-lice*). For successful treatment, remedial and preventive measures should be put in hand early, before the aphides become numerous. Very badly infested leaves should be burned, or deeply buried, and the land should be deeply dug or ploughed. This would prevent egg-laying to a considerable extent.

Lecanium Scale on Ferns.—Specimens of ferns from Norwich were infested with Lecanium scale. This scale is large and easily seen, and the infested parts of the fern should be washed with a very dilute paraffin emulsion. Any badly infested fronds should be cut off and burned.

Chermes on Pinus nobilis.—Specimens of *Pinus nobilis* from Largo (Fife) were received and were found to be infested with a Chermes in one of the stages in its life-history, which is at present not fully known. All affected trees should be sprayed during the winter or dormant season with the winter wash recommended in Leaflet No. 70, or with paraffin emulsion made as follows :—Dissolve 3 lb. of soft soap in 2 quarts of boiling water ; to this, while hot, add 1 pint of paraffin and churn very thoroughly. For use, dilute with 5 gallons of water.

A Useful Spider.—A spider taken on the leading shoot of a young larch tree, and thought to be responsible for damage to the shoot, was identified as *Epeira quadrata*. That it should be found on a killed leading shoot is quite an accident, as the spider is insectivorous. It makes very beautiful webs on heath and gorse, and the female is found in a dome-shaped cell of white silk.

“*Leaf Scald*” on *Apple Trees*.—The trouble known as

"Leaf Scald" is not caused by a fungus, but is a disease of a physiological nature, and is probably found principally where trees are on grass. It has been shown that Cox's Pippin and some other kinds of apple are much injured by growing amongst grass. As an experiment it would be well to try removing the grass from round a few trees as far as the branches extend.

Diseased Peaches.—Peaches from Faversham were found to be affected with the fungus *Penicillium glaucum*, Link. This is a wound-parasite, the spores gaining access to the fruit through a wound. Such wounds are made in the first instance by "green fly" and other minute insects which more especially puncture the thin-skinned varieties of fruit. A judicious use of insecticides will prevent recurrence of the injury.

Fungus on a Lawn.—Specimens of a fungus which was spreading on a lawn were identified as *Marasmius oreades*, Fr., the fairy-ring fungus. The turf should be thoroughly drenched with a solution of sulphate of iron—1 lb. in 3 gallons of water. This treatment will be most effective if applied when the soil is wet from previous rain. (See *Journal*, December, 1907, p. 537).

Diseased Celery.—Celery from Wimborne was found to be suffering from a bad attack of the fungus *Septoria petroselini* var. *apii*, B. and C. All badly diseased plants should be carefully removed and burned. From slightly affected plants the diseased leaves only need be removed. The rows should then be sprayed with a solution of potassium sulphide, beginning with a strength of 1 oz. of sulphide in 2½ gallons of water, and increasing the strength as long as the leaves are not injured.

Diseased Potatoes.—The issue of the Destructive Insects and Pests Order of 1908, which rendered the notification of Black Scab or Warty Disease (*Chrysophlyctis endobiotica*, Schilb) compulsory, and the alarm caused by the description of the injurious effect of this disease, induced a large number of persons to send up specimens of potatoes to the Board for examination. Although a considerable number of these specimens were found to be attacked with this disease, many were affected in quite different ways. A large number, sent up from nearly all parts of the country equally, were marked with a surface scab of uncertain origin. The skin in these cases is marked with a shallow rusty-looking spot of irregular shape, sometimes covering a large part of the potato. It is

probable that the cause in this case is often mechanical. This form of scab might, for example, be due to the presence of considerable quantities of lime or ashes in the soil and is frequently seen in dry seasons. It is of trifling economic importance, for the eating value of the potato is unimpaired. Other potatoes affected in much the same way were pronounced to be suffering from the attacks of the Millipede, *Julus pulchellus* (Leaflet 94). The Corky Scab, *Spongospora scabies*, Massee, described on page 592 of this *Journal*, was found on many others. The potatoes in this case present a rugged scurfy appearance, which would no doubt render them unsaleable. Several other potatoes were more or less affected by Potato Disease, *Phytophthora infestans* (Leaflet 23), or Winter Rot, *Nectria solani* (Leaflet 193). Most of these specimens came from the eastern half of England; very few from the quarter where Warty Disease prevails. An Inspector of the Board has been enquiring into the prevalence of the latter disease, and a report on the subject will eventually be published, but it may be mentioned here that the disease appears at present to be confined to a definite area, which, however, is yearly extending. The chief centres of disease are in the counties of Lancashire, Cheshire, Shropshire, Stafford and Warwickshire.

In 1907 a well-known Swedish agriculturist and member of the Swedish Senate, Mr. Knut Akerberg, of Knistad, Igelstorp, Sweden, forwarded to the Board of **Swedish Red Clover.** Agriculture and Fisheries, through the Consul-General for Sweden, a sample of Swedish red clover for the purpose of comparison with varieties grown in this country. Mr. Akerberg stated that Swedish red clover is very hardy, gives a large crop, and lasts for three years. Owing, however, to its late growth the yield of the after growth is not great; it is a variety which has a great power of resistance against the clover fungus, *Sclerotinia trifoliarum*, Erik., which is very destructive to other kinds of clover.

The Board distributed the seed among several of the agricultural colleges and they have now received reports on the experimental sowings which were made.

The most successful results as regards growth seem to have been obtained at Armstrong College, where a small plot of Swedish red clover was sown in 1906 from seed obtained by a student direct from Sweden. Professor Gilchrist states that in the spring of 1907 this plot was very good and had a healthy appearance. When it was cut that summer the produce, although satisfactory, was not as heavy as that from English, Canadian, or Chilian red clover. It was mown again on 7th July, 1908, but was not as good as the other clovers mentioned. The sample supplied by the Board was sown in the spring of 1907 both in the college garden on a loamy soil and at Cockle Park on a light sandy soil. In the college garden, this was the only red clover among nine that were sown in the spring of 1907 that stood the winter of 1907-8. All these clovers were quite healthy till February, but with the exception of Swedish red clover they succumbed to the cold wet spring. During the summer it made a very good growth.

At Cockle Park, this clover was also sown alongside eight others in the spring of 1907. On 27th April, 1908, it had a thick and bulky covering of herbage, and compared favourably with the other varieties, nearly all of which looked well. They were all cut on 11th July, 1908, and the Swedish clover gave the heaviest cutting.

As regards resistance to disease, a trial which was definitely directed to this point was made at the Midland Agricultural College by Mr. F. Wakerley, Lecturer in Agriculture. Two beds of Swedish red clover were sown in the college garden, one of these beds being treated with soil obtained by digging up dead or dying plants from a "clover sick" field. The other plot was untreated. In addition similar plots of English red clover, Chilian red clover, Lincolnshire grown red clover, and cow grass were laid down for comparison.

All these were sown in the spring, and a good "plant" was obtained. The Swedish variety was characterised by the smallness of the foliage and the close strong crowns of the plants in winter. The beds were inspected from time to time, but it was not until April, 1908, when growth had commenced that disease became evident. At that time new *Sclerotia* were obtained from the Chilian, Lincolnshire grown, and English red clover. The two Swedish beds and the cow grass appeared

to be free from it. The Chilian variety was most affected, about one-half of the plants disappearing, the other two beds losing about one-third of the plants. Two other plots sown with Swedish red clover in another garden, and respectively "treated" and "untreated" with affected soil, also appeared free from disease.

An inspection of the six beds on 9th September, 1908, showed that the untreated Swedish bore the strongest crop, the "treated" bed being about the same, but perhaps a little weaker. The cow grass and the English red clover were about equal, but the plants were not so numerous, the Lincolnshire grown clover was poor and going off, while the Chilian variety was weak.

The Swedish clover was much later than the others at the time of cutting and produced only a small after-growth. Up to the middle of September it had not shown disease and appeared to be lasting well. The diminished yield of the second crop was due to the smallness of growth, and not to the disappearance of the plants as in the case of the Chilian variety.

The reports received from the other centres were less satisfactory. Professor Seton of Leeds University states that the sample was sown in May, 1907, in soil which had carried red clover since 1901. During that period the clover had been once renewed, and distinct damage by *Sclerotinia* was noted in several years. The plot sown with Swedish seed showed no striking features, but in September last it was very thin and becoming impure owing to the growth of weeds. No trace of disease had been observed, but it did not seem to have established itself so well as the previous sowings with British seed.

The manager of the experimental farm of the Department of Agriculture, Cambridge University, Mr. H. Henshaw, reports that the seed was sown at the farm and carefully watched, but instead of having any special properties in the way of resistance, it appeared to have none at all, for whereas a partial crop was obtained from double-cut cow grass grown alongside and under the same conditions, the Swedish clover did not yield a single plant, all having died off during the spring. The crop also failed at the Harper-Adams Agricultural College.

The Swedish red clover sent for trial would appear to be a compact and hardy form of cow grass or "single-cut clover."

The tests do not indicate that it is a better hay plant than varieties already common in Britain; but from the accounts given of it, this variety would seem to be well adapted for depasturing, and it may be recommended to the notice of those laying down pastures for two to three years in the eastern and north-eastern counties.

The second report of the President of the Board of Agriculture and Fisheries on the management of the principal agricultural estates belonging to the

Small Holdings on Crown Lands. Commissioner of Woods is published in the annual report of the Commissioners of H. M. Woods and Forests, dated 29th June, 1908 (H. C. 203, price 1s.). A summary of Lord Carrington's first report appeared in this *Journal*, August, 1907, p. 278.

The estates dealt with comprised at 31st March, 1908, about 62,810 acres, and of this area 4,187 acres was let for small holdings and allotments as compared with an area of 993 acres so let two years before. Of the present area 714 acres are used as allotments of under 5 acres, and 3,473 acres are occupied in 149 small holdings.

Although in accordance with the principal object of the transfer to Lord Carrington, his lordship's policy has been to encourage the establishment of small holdings wherever practicable, this policy is not being carried out with any sacrifice of revenue nor with any undue disturbance of sitting tenants.

Consideration for sitting tenants necessarily involves in some cases prolonged negotiation and some delay in obtaining the land that is required, but satisfactory progress has been made in the creation of small holdings, and with time there is every expectation of largely increasing the number of small holdings on the Crown estates.

The aggregate ultimate rents of the 1,847 acres let in small holdings and allotments during the past year amounts to £3,112 10s. per annum, as compared with a total rent of £2,566 10s. per annum, formerly paid. Some of the land formed parts only of two large farms, and the remainder of those farms was relet to farm tenants at improved rents, the result

of the whole rearrangement and letting for small holdings and allotments effected during the past year being an increased rent of £844 per annum (or about 25 per cent. increase on the old rents), exclusive of interest on the outlay in equipment of the small holdings, showing that while a boon is granted to the agricultural labourer and other small holders, a pecuniary advantage is also obtained by the landlord.

In addition to the lettings already effected, arrangements have been made by which possession is about to be obtained of 831 acres which will then be adapted for further small holdings and allotments.

The report of H. M. Commissioners of Woods and Forests for 1907-8 states that the work of the School of Forestry established in the Forest of Dean has progressed satisfactorily during the year.
School of Forestry in the Forest of Dean. In October, 1907, the six students of the senior class were examined, and all obtained their certificates. The eight students in the junior class were also examined at the end of their first year's work, and all did satisfactorily, and are now undergoing their second year's instruction at the school. In November, 1907, a fifth class of eight students was admitted to the school, the number of applicants being larger than could be admitted. These students are all doing well. There are thus at the present sixteen students at the school. Since 1st January, 1904, when the school was started, there have been five classes admitted to the school, with a total number of thirty-nine students. Of these, four were found unsuitable, and were dismissed before completing the school course, nineteen satisfactorily passed the examinations, and were granted certificates, and sixteen are still at the school.

Of the nineteen passed students, four are now Crown woodmen, one each in Dean Forest, New Forest, Windsor, and Tintern, one is assistant inspector of Poles, Postal Department, five are employed as foresters or woodmen on private estates, one is working in a large public nursery, eight are employed as Crown workmen in Dean Forest; thus no such student is out of employment.

The school having been placed during the year on a permanent basis, arrangements have been made to improve the facilities

for practical instruction. An area of about 25 acres of Dean Forest is shortly to be handed over to the school as an instructional area, and the students are at present engaged in making a new nursery ; in both of these areas all work will be done by the students. Carpentry is now added to the instruction given, each student working for two months in the carpenter's shop. Increased facilities have also been given for practical instruction in the laying of hedges. Arrangements are being made to provide a permanent building for the school and museum, and to provide lodgings there for eight of the students. In future the minimum age of admission will be twenty years instead of sixteen, and the student will be paid 15s. a week instead of 10s.

An additional area of 4 acres has been planted up in the experimental plots at Abbotswood. The museum has been improved by the addition of an excellently set up collection of twenty-six species of injurious insects, showing their life histories and the damage they do to the forest trees, and by a collection of the seeds of 250 species of trees and shrubs.

It is hoped that by raising the age of entry, the students when they have obtained their certificates will be fit to go out as assistant foresters or head woodmen.

The governing body of the National Fruit and Cider Institute propose to present to the various bodies and county councils, which contribute to the maintenance **Model Cider Orchards.** of the Institute, a number of cider apple and perry pear trees grown in the Institute nursery with a view to the establishment of typical cider and perry orchards in the cider-producing counties.

The Managing Committee of the Institute make the following suggestions for the guidance of the county councils and other bodies receiving these trees :—

1. Investigations carried out at the Institute have demonstrated that in making cider it is very important that fruit in different stages of ripeness—some half-ripe, some fully ripe, and some perhaps over-ripe—should not be mixed together ; at each time of grinding the fruit used should all have ripened at about the same time. It is also important in making a blend of different varieties that all three classes—sweet, bittersweet, and sharp—should be available for the make.

There are, of course, few, if any, orchards existing at the present time containing fruit which would fulfil all the above conditions. It is, therefore, highly desirable that in each of the counties contributing to the Institute such orchards should be formed. It is not necessary that the whole of the orchard should contain fruit ripening at one and the same time. It might, if thought convenient, be divided into three sections of early ripening, mid-season ripening, and late ripening fruit, but the trees in each section should consist of the three classes—sweet, bitter-sweet, and sharp—already mentioned. The Committee, therefore, suggest that arrangements should be made for forming such orchards by means of the trees now available for distribution.

2. Where the trees are planted on the land of private owners, the owners should enter into a legal agreement to plant and protect them properly, and to permit the horticultural instructors and other persons authorised by the county councils to have free access to them in order to view their condition and treatment, prune, or give demonstrations in pruning them, spray or dress them if necessary, and make use of them for purposes of instruction or demonstration.

3. The Governors of the Institute should have the option, when the trees begin to bear, of buying at market price as much of the fruit as may be required for experimental purposes, and they and anyone authorised by them should have permission at all reasonable times to visit and inspect the trees for the purpose of noting their condition and progress, and of making and recording such observations thereon as may be of service to persons engaged in the fruit-growing and cider-making industries.

The Board of Agriculture and Fisheries have received the following report on small fruit culture in Lower Normandy,

Fruit Culture in France, which has been prepared by

Mr. Vice-Consul Hettier :—

Normandy.* The district of Caen, and the Department of Calvados are principally agri-

* Some further information as to Fruit Culture in France will be found in an article on Fruit and Vegetable Production in Germany, France, and Holland, in this *Journal*, September, 1908, p. 414.

cultural. Wheat-growing and horse-breeding are the staple industries. The small fruit culture is stationary, and no progress in that direction is to be seen.

Apples.—Cider apples are the great source of wealth in this district, which is admirably situated for exportation. The great facilities for traffic, the rapidity of transport by rail and by several lines of steamers to England from Havre, Honfleur, Caen and Cherbourg have given a fresh impetus to this branch of agriculture. The number of trees planted is yearly increasing, and the 1908 crop is generally extremely abundant.

Although the prices have not yet been established on a firm basis, it is generally understood that they will vary between 2 fr. 50 c. and 3 fr. per hectolitre (9d. or 11d. per bushel), which is very moderate.

Apples known as "fruit au couteau," for dessert, have not given such good returns, and this class of fruit may become the object of importation either from England or Canada, whence a great number have been imported in previous years as dried apples.

Cherries.—The crop has been very large and good in Maine, Touraine, and the centre of France. Prices have been kept rather low, but scarcely any have been shipped to England, nearly the whole crop being sent to Paris. Caen has exported none through the Newhaven steamers. Some have been sent here from the southern parts of France, where they can be bought at the lowest prices.

Gooseberries.—These are grown in small quantities, in farm and ordinary vegetable gardens, simply for the consumption of the inhabitants and for jam. There is no jam factory in this district. It is prepared privately and not for sale. Notwithstanding this, a gentleman at Manneville, near Caen, has begun planting on a large scale. But this attempt is too recent to allow of any general remark, the results already known being too uncertain. The crop has been only moderately satisfactory.

Black Currants.—These are not cultivated here, except in gardens. The general consumption, which is small, is supplied from Angers. Two years ago one grower started planting a great quantity of gooseberry and black currant bushes. He has been able to export this year about 15 tons of black currants, but no gooseberries.

Plums.—This year's crop has been large. The Canton of St. Pierre-sur-Dives, Calvados, is the only part of this region where they are grown in numbers. But for the fruit coming from the Touraine and South of France the local supply would be very short.

Pears.—Cider pears are grown in less quantity than formerly, the "poire," or cider pear, being out of favour. This year's production has been very meagre. The yield of dessert pears has been better, but not of a first class quality for preserving.

Nuts.—Walnuts, fresh walnuts, or "cerneaux," which are in great demand during the season, have been for the most part insufficiently supplied by the local production. The yield has been small, on account of the severe frosts which prevailed during the months of March and April and destroyed the blooms.

Dry Walnuts.—These are not prepared industrially in this district. Nearly the whole supply is sent from the South.

Chestnuts.—The appearance is satisfactory. They mostly come from Touraine, Anjou and the centre of France.

General.—The ground occupied by small fruit culture is diminishing gradually, Honfleur being a remarkable exception, and the isolated attempts at Manneville and Ussy not yet having given sufficient returns to lead to these examples being followed. The prices given in Paris for some of these fruits are generally higher than in London. For instance, all the cherries have been sent to Paris instead of London, and, unlike 1907, none have been exported from Caen to England, though the general crop in France was very large:

The month of October has been marked by weather of quite an unusual character. During the *first week* (ending 3rd October) the weather was very fine and bright over the kingdom generally. The temperature was high for

Notes on the Weather in October. the time of year, warmth being "very unusual" everywhere. In several parts of Great Britain the maximum temperatures were higher than any hitherto recorded so late in the year, while on most of the nights the minimum temperatures were relatively high, the thermometer not always falling to 60°. Sunshine was, except in Scotland, W., "abundant" or "very abundant," while rainfall was "light" or "very light."

Similar weather prevailed during the *second week*, though not in so marked a degree. The temperature was again "very unusual" everywhere, and the rainfall "light" (England, N.E. "very light"), while sunshine was "abundant" in England, E., N.W., and S.E.). The number of accumulated day degrees of temperature both

for the week, and for the autumn was much above the average of the last 25 years, England N.E. having enjoyed as many as 581 or 124 more than the average. There were no negative degrees recorded for the week a condition which is also remarkable.

The third week again experienced "very unusual" temperature throughout the United Kingdom, and rainfall was "light" or "very light" everywhere except in England E. and S.W. Sunshine, however, was less abundant, fog and mist prevailing in several places.

During the fourth week of October the weather was of a more seasonable character. Only in England N.E. and Scotland W. was the temperature "unusual," and rainfall was "heavy" in the Midlands and England S.W. Some snow fell in Cromer, and bright sunshine was less than normal throughout the kingdom generally. In the east of Great Britain the number of accumulated day-degrees was below the average, but there were no negative day-degrees recorded.

The weather in the fifth week reverted to the type prevailing at the beginning of the month. The temperature was "unusual" everywhere except England S.W. where it was "moderate," and rainfall was "light" in many places. Negative day degrees were, however, recorded in the Midlands, and night frosts on the grass occurred in most parts of England.

The effect of the exceptional weather has been noticed by several of the Board's correspondents, who comment on the fact that the vegetation has been very little checked, and that the grass was still growing. One correspondent in Berkshire notices that the dahlias were blooming till cut by the frost on the 25th, and that peas were to be had till quite late. The wheat sowing in this district was said to be concluded.

Germany.—The report on the crops in the middle of October issued by the Imperial Statistical Bureau states that the weather during the previous three weeks was dry and warm, and that rain was everywhere desired.

Notes on Crop Prospects Abroad. The sowing of winter cereals was behindhand owing to the dryness, but no reliable opinion as to the winter sowings could be given. Views as to the yield of potatoes were very diverse; in some neighbourhoods the crop had not come up to expectations either in quantity or quality, elsewhere it was better than was anticipated, or was described as good. On the whole an average crop is probable. Potato disease had been checked by the dry weather, and only with sorts specially liable to disease or in wet, heavy soils was any large percentage of diseased tubers to be found. The report of the *Landwirtschaftsrat*, dated 1st November, estimated the potato crop at 95·9 per cent. of an average crop.

Hops in Germany.—The area under hops in Germany showed a reduction in 1908, the total surface planted being officially returned as 88,587 acres as compared with 94,594 acres in 1907. This is a lower figure than has been previously reported. The bulk of this area is situated in Bavaria, which accounts for 56,691 acres out of the total for 1908 as against 60,665 acres in 1907.

It is stated (*Foreign Office Report, Annual Series, No. 4136*) in the official report of the Bavarian Farmers' Association, that owing to the low price obtainable for hops in 1907, the crop which cost £1,225,000 to produce only realized £812,500.

Hungary.—According to the official report on the crops in the middle of October, the maize crop may be regarded as a medium one. The area cultivated was 5,927,000 acres, and the yield is estimated at 76,652,000 cwts., as against 77,786,000 cwts. last year. The potato crop is below the average; the area was 1,440,000 acres and the crop 3,622,000 tons, as compared with 4,771,000 tons last year.

Roumania.—The Board have received a despatch through the Foreign Office from Mr. Consul Wardrop, in which it is stated that the year has been unfavourable for the cereal harvest; the dry spring tended to ripen the grain without filling it,

and the harvest began ten days earlier than usual. The total yield of wheat is estimated, in a report presented to the Minister of Agriculture by the Agronomic Station, to reach 63,250,000 bushels. The quality is good, and in some districts very good, though bad in the regions where the drought was very severe, such as Braila, Covurlin (Galatz) and Tulcea. Generally speaking, however, the grain is heavy and of good appearance; 25 per cent. of it is said to weigh over 64 lb. per bushel. The average yield is about 14½ bushels per acre. About 27,500,000 bushels will, it is estimated, be available for export. According to the official statistics published in the *Moniteur Commercial Roumain* (6th October), the area sown in 1908 was: wheat, 4,450,161 acres; barley, 1,531,869 acres; and maize, 4,990,178 acres. These figures represent an increase of 215,798 acres of wheat and 272,927 acres of barley above the figures of 1907, the latter figure being higher than the average of the preceding five years. The acreage of maize was about the average. The British Vice-Consul at Galatz (Mr. N. L. Shadwell) reports (*Board of Trade Journal*, 22nd October) that the crops are better than was expected, though it cannot be called a good year. The wheat crop is above that of last year and of very good quality. The barley and oat crops are short and of a poor quality. Maize promises to give a good crop.

South Russia.—H.M. Consul-General at Constantinople (Mr. H. C. A. Eyres) reports, under date of 9th October, that according to information received from Southern Russia the weather was extremely unfavourable just before the time of harvest. In the districts supplying Odessa, Nicolaieff and Kherson, and in the Crimea barley was on the whole a fair average crop, but the quality was greatly injured by rain after cutting. Oats proved a small crop, and rye a total failure. Wheat is under average, but the prospects of maize are excellent. It is not yet known whether the latter will be sufficiently dry for immediate shipment. No reliable information was available concerning the Azov districts.—*Board of Trade Journal*, 15th October, 1908.

Mr. Consul-General Smith, of Odessa, writing on 22nd October, states that the crops in South Russia are officially estimated as follows:—Winter wheat, unsatisfactory; spring wheat and barley, average; rye, below average; oats, above average.

Poland.—The Board have received, through the Foreign Office, a report by Mr. C. Clive-Bayley, H.M. Consul at Warsaw, on the harvest of 1908, based on a report by the Central Agricultural Society of Poland. Winter wheat was satisfactory all over the district, being good in the greater portions of the Governments of Radom, Lublin, Siedlce, and Grodno. Spring wheat was rather above the average, except in a portion of the Government of Grodno, where it was very good. Rye was good in a small portion of Grodno and Siedlce, satisfactory in all other Governments except Kaliz, Pietrkoff and Kielce, where it was very bad. Oats were good in Grodno and Siedlce and satisfactory in the other Governments. Barley was only good in the centre of Poland, but satisfactory elsewhere.

Canada.—The Crop Bulletin issued by the Census and Statistics Office of the Canadian Government for the month of September estimates, on the basis of the actual threshing results, so far as they had been obtained, that the average yield of wheat is 17½ bushels, indicating a total production of 115,651,000 bushels; of oats, 33·7 bushels per acre, or a total production of 267,651,000 bushels; and of barley, 29 bushels per acre, or a production of 50,723,000 bushels. The yield of wheat, according to these returns, is less than was anticipated.

Argentina.—According to a cabled report issued in *Dornbusch's Evening List* (19th October), the Minister of Agriculture estimates the area sown with wheat in 1908 at 14,989,000 acres against 14,227,000 acres in 1907, with linseed at 3,814,000 acres against 3,437,000 acres, and with oats at 1,565,000 acres against 703,000 acres in the earlier year. The total yield for the coming season is estimated at 5,760,000 tons of wheat, 1,228,000 tons of linseed and 823,000 tons of oats. The final figures for the 1907 wheat crop were 5,238,705 tons. According to an estimate issued by the Minister of Agriculture on 4th November, the damage done to crops by frost was put at

10 per cent. in the case of wheat and oats and 15 per cent. in the case of linseed. It is still expected, however, that the wheat crop will equal that of last season.

New South Wales.—The preliminary official estimate (*Dornbusch*, 23rd October) of the harvest in New South Wales put the yield at from 18 to 20 million bushels, "provided the present favourable weather conditions continue."

Wheat Cultivation in Western Australia.—The return of crops and live stock in Western Australia for the season 1907-08 shows that the cultivation of wheat has rapidly expanded during the last ten years, the area having increased from 75,032 acres, with a production of 870,909 bushels (an average of 11·6 bushels per acre), in 1898-99, to 250,000 acres, with a production of 2,758,567 bushels (11 bushels per acre), in 1906-07, and 281,000 acres, producing 2,933,350 bushels (10·5 bushels per acre), in 1907-08. The Government Statistician estimates that the surplus available for export of the last wheat harvest amounted to 693,317 bushels.

South Australia.—The Board of Trade Correspondent at Adelaide (Mr. J. Creswell) reported early in September that favourable rains had occurred and that a good harvest was practically assured. (*Board of Trade Journal*, 8th October, 1908.)

Hop Crop in the United States.—In its final report on the hop crop of 1908 the *American Agriculturist* of 26th September, 1908, states that the season has been the most unsatisfactory and discouraging for many years. Owing to the very low prices obtainable, many growers, particularly on the Pacific coast, abandoned their acreage in order to devote their energy and capital to more remunerative undertakings.

The 1908 crop is estimated at 240,000 bales (386,000 cwts.) as against about 300,000 bales (477,000 cwts.) in 1907, and about 365,000 bales (568,000 cwts.) in 1906, or a decrease of 20 per cent. and 35 per cent. respectively. The decrease would appear to be mainly due to the fact that the area actually brought to harvest is some 6,000 to 7,000 acres less than last year on the Pacific coast, and 3,000 acres less in New York. The actual yield is variable, but on the whole a little below average. Reports from the West unanimously insist that growers are going out of the business owing to the extremely bad prices. Renters with limited resources have found difficulty in paying the pickers; banks are slow to loan money on a crop which deteriorates so badly after the first season, and speculators will only make contracts for future delivery at very low figures. "It is evidently a case of over-production." The downward trend of prices has been almost constant, and certainly very serious, since the high level of 1903-4. At that time New York prices were as high as 32 cents per lb. (£7 9s. 4d. per cwt.), and Pacific coast 28 cents (£6 10s. 8d. per cwt.). In September of this year quite general prices were 11 to 12 and 7 to 8 cents (£2 11s. 4d. to £2 16s., and £1 12s. 8d. to £1 17s. 4d. per cwt.) respectively.

In the fiscal year ending 30th June, 1908, nearly 23,000,000 lb. (205,000 cwts.) of hops were exported from the United States, but at an average value of only 13 cents per lb. (£3 os. 8d. per cwt.) as compared with 21 cents (£4 18s. per cwt.) in 1907, when, however, the quantity exported was only 17,000,000 lb. (152,000 cwts.). The 1908 exports have absorbed some of the accumulated surplus, and an important feature of the situation is the reduction of the stocks of old hops in this country. The amount on hand is apparently not enough to have much influence on prices, especially as much of it is two or three years old, and therefore of little intrinsic value.

From Oregon, picking is reported to have commenced with contract prices at 7 cents to 11 cents per lb. (£1 12s. 8d. to £2 11s. 4d. per cwt.), the hops being average quality, but many yards attacked with red spider. The Californian crop, as a whole, shows a relatively larger volume than further north, but the same discouragement and poor profits are apparent. In New York the relatively better prices have been offset by a lower yield per acre.

The Board of Agriculture and Fisheries have issued the following preliminary statement showing the estimated total produce and yield per acre of the **Corn**, **Pulse**,

Produce of Crops. and **Hay Crops** in Great Britain in the year 1908, with comparisons for 1907, and the average yield per acre of the ten years 1898-1907.

Crops.	Estimated Total Produce in Great Britain.		Acreage in Great Britain.		Average Estimated Yield per Acre.		Average of the Ten Years 1898-1907.
	1908.	1907.	1908.	1907.	1908.	1907.	
Wheat ...	Quarters. 6,565,370	Quarters. 6,900,774	Acres. 1,626,733	Acres. 1,625,436	Bushels. 32·29	Bushels. 33·96	Bushels. 31·70
Barley ...	6,839,081	7,546,273	1,667,437	1,712,694	32·81	35·26	33·38
Oats ...	15,467,616	16,799,015	3,108,844	3,122,590	39·80	43·04	39·75
Beans ...	1,105,442	1,328,630	293,228	308,131	30·16	34·50	30·06
Peas ...	544,533	592,077	154,398	160,876	28·21	29·44	27·29
Hay from clover, sainfoin, &c.	Tons. 3,507,468	Tons. 3,709,977	2,232,353	2,250,319	Cwts. 31·42	Cwts. 32·97	Cwts. 29·95
Hay from permanent grass ...	6,214,431	6,719,257	4,949,038	4,935,935	25·11	27·23	24·21

The preliminary statement of the produce and yield per acre of **Potatoes** and **Roots** in 1908 will be issued shortly.

The Board of Agriculture and Fisheries have issued the following preliminary statement showing the estimated total production of hops in the years 1908 and 1907, with the acreage and estimated average yield per acre in each county of England in which hops were grown :—

Counties, &c.	Estimated Total Produce.		Acreage Returned on 4th June.		Estimated Average Yield per Acre.*	
	1908.	1907.	1908.	1907.	1908.	1907.
Kent ...	East ...	Cwts. 84,469	Cwts. 63,663	Acres. 7,364	Acres. 9,200	Cwts. 11·47
	Mid ...	118,003	64,489	7,900	9,443	6·92
	Weald ...	108,843	93,708	8,711	9,526	14·94
	Total, Kent	311,315	221,860	23,975	28,169	12·49
Gloucester ...	...	221	242	45	46	4·91
Hants ...	...	21,176	17,865	1,636	1,842	12·94
Hereford ...	...	54,554	58,268	5,572	6,143	9·79
Salop ...	...	1,015	910	113	129	8·98
Surrey ...	...	8,021	7,089	648	744	7·05
Sussex ..	...	40,203	39,679	3,579	4,243	11·23
Worcester ...	...	34,256	28,216	3,353	3,622	10·22
Total ...	...	470,761	374,129	38,921	44,938	12·10
						8·33

* The average yield per acre is calculated on the acreage returned on 4th June ; but as a certain proportion of that acreage was not picked, the yield per acre on the acreage actually picked would be rather higher.

The Board of Agriculture and Fisheries have been furnished by the Board of Trade with the following report, based on **Agricultural Labour** about 210 returns from correspondents in **in England** various districts on the demand for during October. agricultural labour in October :—

There was little or no interruption to employment in October from the weather, which was fine on the whole. The demand for extra labour was fairly good, but it was generally fully met by the supply, and in several districts there was some surplus; in certain districts in the Eastern counties, however, there was not a sufficient number of men for potato digging.

Northern Counties.—There was a fairly good demand for extra labour in *Northumberland*, *Cumberland*, *Westmorland* and *Lancashire*, chiefly for potato lifting, but the supply was sufficient. Employment was generally regular in *Yorkshire*, where there was a good deal of employment on the potato and mangel crops. In some districts, however, day labourers were not able to get regular work.

Midland Counties.—Employment was regular in *Cheshire*, where there was a fairly evenly balanced supply of and demand for labour. Work on the potato and mangel crops and threshing caused a good and constant demand for extra men in *Nottinghamshire* and *Leicestershire*, which was fully met by the supply. Employment was regular in *Staffordshire*, but day labourers tended to be somewhat in excess of the demand. There was a good demand for extra labour in *Shropshire*, and a correspondent in the Wellington Union reports that more men would have been employed if they could have been obtained. There was generally regular employment in *Worcestershire* and *Warwickshire*, though a few day labourers were reported as in irregular work. Listing potatoes, cutting mangels, and carting manure afforded a good deal of employment to day labourers in *Northamptonshire*, *Oxfordshire* and *Buckinghamshire*; the supply of this class of labour was said to be ample. Employment was fairly regular in *Hertfordshire* and *Bedfordshire*.

Eastern Counties.—There was a good demand for extra men in *Huntingdonshire* and *Cambridgeshire*, the supply being insufficient in certain districts. Work was plentiful in *Lincolnshire* on account of threshing, and lifting the potato and mangel crops. Although many Irish labourers were employed, the supply of extra labour in some districts was not equal to the demand. It was reported that day labourers were also in some demand in Unions in *Norfolk* and *Suffolk*, but generally speaking the supply of extra men in these counties and in *Essex* was quite sufficient for requirements.

Southern and South Western Counties.—Raising potatoes and mangels, threshing and hedge trimming caused a fair demand for labour in *Kent* and *Surrey*, but the supply was generally in excess of the demand, and consequently there was some irregularity of employment among day labourers. Similar reports come from *Sussex* and *Hampshire*. A demand for extra labour was reported from certain districts in *Berkshire*. In *Wiltshire* the demand was fair, but in some districts was more than met by the supply. Threshing and other work generally provided regular employment in *Dorset*. Some interruption to outdoor work, due to rain, was reported in *Somerset*, where otherwise employment was regular, and the supply of labour on the whole about equalled by the demand. There was generally regularity of employment in *Herefordshire*. In *Gloucestershire* there was some irregularity of employment among day labourers, the supply being in excess of the demand. Employment was generally regular in *Devonshire* and *Cornwall*, where raising the mangel and potato crops, threshing and hedge trimming caused a demand for extra men in several Unions.

Japanese Fruit Scale in Argentina.—The Board have received, through the Foreign Office, a copy of an Argentine law, dated 31st August, 1908, authorising the payment of a reward of 50,000 dollars paper currency (£4,327) to the person who shall discover the most economical and efficacious procedure for destroying the scale insect *Diaspis Pentagona*. It is believed that this pest was introduced into the Republic some four or five

**Miscellaneous
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years ago from Europe, and it has spread with astonishing rapidity. An account of this insect, *Aulacaspis (Diaspis) pentagona* (Targioni-Tozzetti), the Japanese Fruit Scale, will be found in Newstead's Monograph of the British Coccidae, Vol. I, p. 173.

Importation of Potatoes into Crete.—With reference to the note in this *Journal* (March, 1907), as to the importation of potatoes into Crete, the Board have now received through the Foreign Office a copy of a law dated 11th August, 1908, which permits the importation of potatoes, coming from countries which have been officially declared by their Governments to be free from phylloxera, when accompanied by a certificate, duly legalised, from the local authority of the country of origin containing a description of the consignment. Potatoes from other countries will be admitted subject to disinfection at the port. The text of the law, which relates also to other plants, may be seen at the Offices of the Board.

Importation of Wool and Various Animal Products into Sweden.—The Board of Agriculture are in receipt, through the Board of Trade, of information to the effect that the importation of wool into Sweden from Great Britain can now be effected subject only to the restrictions imposed by the Swedish Royal Ordinance of 9th December, 1904, to prevent the introduction of epizootic disease. This is due to the fact that Great Britain is now recognised by the Swedish Government to be free from contagious foot and mouth disease.

A Swedish Royal Ordinance, dated 6th August last, has also been received, containing revised regulations prohibiting the importation, from countries and districts declared infected with contagious foot and mouth disease, of unmelted tallow and suet, chaps, blood and fresh bone of ruminant animals and swine, farming or swine-pen appliances already used, fodder, and litter of hay and straw. The importation from such countries and districts of intestines, hair, bristles, wool, horns, hoofs, and unprepared hides and skins of the animals referred to is permitted, subject to certain specified conditions including disinfection on arrival. A translation of the Ordinance may be inspected at the Offices of the Board.

Pollution of Streams by Sheep-Dipping.—A suggestion has been made to the Board that there is a possibility of some pollution to streams and ponds arising from the improper disposal of the residue of the dipping material after sheep-dipping has been done. Flockmasters should bear in mind that this residue is necessarily injurious to animal life when a poisonous dip has been used, and should therefore be careful to dispose of it, so as to avoid any possible pollution of streams, ponds, or drinking places.

Certification of Meat Products Exported to the United States.—With reference to the notice which appeared on p. 140 of this *Journal* for May last, relative to the official certification of meat-food products intended for export from the United Kingdom to the United States and the Philippine Islands, the Board are informed that the new system of certification is now in operation.

It is understood that, in addition to obtaining the certificates prescribed by the Memorandum of the Local Government Board, exporters of meat-food products to the United States or the Philippine Islands are required to make, before a United States Consular officer, a declaration to be attached to the invoice of the goods, as provided by Regulation 33, of the "Rules and Regulations for the Enforcement of the Food and Drugs Act."

Agricultural Machinery Trade in South Russia.—A memorandum on this subject by H.M.'s Consul-General at Odessa (Mr. C. S. Smith) appears in the *Board of Trade Journal*, 24th September, 1908.

Agricultural Bank in Cyprus.—The Annual Colonial Office Report on Cyprus (Cd. 4199), states that the Agricultural Bank commenced operations in 1907 in accordance with the agreement entered into by the Government with the Anglo-Egyptian Land Allotment Company. Under this agreement the capital of the bank was not to be less than £100,000, and its principal business was to make advances to the agricultural and industrial classes of the Island upon security of immoveable property, stock, agricultural and industrial produce, personal security, and such other security as the Company might determine.

The rate of interest was fixed not to exceed 9 per cent. per annum. The advantages of this bank have been greatly appreciated, and it has brought relief to many belonging to the classes for whom it was desired to obtain a more reasonable way, than prevailed locally, of borrowing money for legitimate enterprise or of tiding over temporary difficulties. To 31st December, 1907, £308 had been lent for short periods, of which £165 had been repaid, while to the same date for longer periods £53,573 had been advanced.

State Forest in Scotland.—The Report of H. M.'s Commissioners of Woods and Forests for 1907-08, states that during the past year the purchase has been completed of the Inverliever Estate, containing about 12,530 acres lying at an elevation between, about 120 and 1,400 feet above sea level on the north-west side of Loch Awe, in the county of Argyll. The land is occupied as sheep farms except about 290 acres which is under timber.

The purchase has been made for the purpose of carrying out a scheme of afforestation in Scotland on scientific and economic lines. The estate has been carefully selected with a view to its suitability for this purpose, and it is proposed gradually to plant it at the rate of 150 acres per annum. Arrangements are being made for a commencement of the work this year. A residential Forester has been appointed who will act under the general supervision of the Commissioners.

Rat extermination in Denmark.—The law for the extirmination of rats, to which reference was made in this *Journal*, July 1908, p. 295, came into force on 1st July, 1907, and may be said to have worked satisfactorily, though the State grant of 3 kr. (3s. 4½d.) for every 100 inhabitants is not considered a sufficient inducement, and some parishes have added considerably to that amount.

As regards the number of rats killed the following figures are given:—At Magleby in Langeland with 912 inhabitants 3,145 rats have been accounted for; at Gudbjerg, near Svendborg, with a population of 1,605, 4,322 rats have been killed in the last nine months of 1907; Nakskov, with 8,421 inhabitants, has accounted for 11,952 rats. In Copenhagen itself the unemployed have to some extent found occupation in rat killing, the number of rats exterminated reaching 5,000 to 6,000 a week, whilst for the rest of Denmark the weekly figure has amounted to 10,000 to 15,000 rats. On nine of the Danish islands rats are unknown, but, on the other hand, on the Island of Fejø, where eight years ago there were no rats, there is now a numerous colony. (*Foreign Office Report, Annual Series*, No. 4089.)

Inspection of Meat for Export in Denmark.—A translation of a Danish law for the Control of the Export of Meat, &c., which was passed in 1908, is given in *Foreign Office Report*, No. 4089, *Annual Series*. This law authorises the Minister of Agriculture to take steps to prevent meat being exported which is unfit for human food. Regulations may be issued providing for the marking of all Danish meat exported.

Importation of Plants into Mozambique.—The Board have received a copy of the regulations dated 22nd May, 1908, for the importation of plants into the district of Laurenço Marques, Portuguese East Africa, which provide that no plants can be

imported until the consignee has secured a permit from the Agricultural Department of the Province of Mozambique. The same person may not be granted a permit for more than ten plants or one hundred cuttings of one kind during the year. Stocks, excepting apples resistant to *Schizoneura lanigera*, pears, plums, apricots, cherry, mango, rose and persimmon stocks, together with vines, peaches, and some other plants are prohibited, except by special permit from the Agricultural Department. Imports will be inspected on arrival, and if necessary disinfected ; if they are found to be infected with certain pests they are liable to be destroyed.

Supply of Phosphates in the United States—A note was given in this *Journal* (February, 1908, p. 696) in which the production of raw phosphate in the United States was roughly estimated at 2,000,000 tons. It appears, however, that this figure has been exceeded during the past two years, and that the production of phosphate rock in the United States in 1907, as estimated by the Geological Survey, was as follows :—Florida, 1,386,578 tons (of 2,240 lb.) ; South Carolina, 262,198 tons ; Tennessee, 707,710 tons, making a total production of 2,356,486 tons. The exports from Christmas Island in 1907 amounted to 110,375 tons, as compared with 96,449 in 1906. (*Board of Trade Journal*, 6th August, 1908.)

Agriculture in Bulgaria. Opening for machinery.—H.M. Vice-Consul at Varna (Mr. H. C. Venables), in reporting on agricultural conditions in Bulgaria, states that one of the richest grain-producing districts is that between Roustchouk and Varna. Here the land is practically all divided into small holdings owned by peasant proprietors, who are very thrifty and industrious. Bulgaria, says the Vice-Consul, is passing through a period of transition, and, as regards agriculture, this is illustrated by the fact that on one farm operations may be conducted by the aid of the most primitive implements, whilst on an adjoining farm the most modern appliances may be in use. There is, indeed, a distinct popular tendency towards progress, and the next few years will probably be a period of steady advance, providing valuable opportunities to the foreign manufacturer of agricultural implements. The total area of land under cultivation in 1907, continues the Vice-Consul, was 741,330 acres, as compared with 703,872 acres in 1906 and 689,153 acres in 1905. This increase has been largely brought about by the sale of Government pasture, which shows that Bulgaria has definitely taken up agriculture instead of cattle-rearing. (*Board of Trade Journal*, 6th August, 1908.)

SUMMARY OF AGRICULTURAL EXPERIMENTS.*

EXPERIMENTS WITH POTATOES.

Manuring of Potatoes (Univ. Coll. of Wales, Aberystwyth, Agric. Dept., Rept. on Expts., 1906).—This experiment was carried out at two centres in Cardiganshire in 1905, and on the College Farm in 1906. The results were similar in both cases, and as the seasons were very dissimilar it is considered that the conclusions must hold good so far as typical Cardiganshire soils are concerned. These are (1) that phosphoric acid and not potash is the most necessary ingredient for potatoes in this part of Wales ; (2) that potatoes are more liable to disease when a heavy dressing of farmyard manure is applied ; (3) that the most economical dressing for potatoes is 10 tons of farmyard manure and a dressing of nitrogenous and phosphatic manures ($\frac{7}{8}$ cwt. sulphate of ammonia and $2\frac{1}{2}$ cwts. superphosphate) ; (4) that it is possible to grow a good crop of potatoes with artificial manures alone, especially in a wet season.

* See Experiments with Cereals, September, 1908, p. 458; Experiments with Root Crops, October, 1908, p. 536.

Manuring of Potatoes (Harper-Adams Coll., Field Expts., 1907).—Trials were made at one centre in Staffordshire and at the College Farm to compare a special potato manure and two home-mixed dressings, costing the same amount per acre. The best results were obtained from the special compound at the College and from one of the mixtures at the other centre. A comparison of sulphate of ammonia, calcium cyanamide, and nitrate of soda was also made at the College Farm.

Manuring of Potatoes (Cambridge Univ., Dept. of Agric., Guide to Expts., 1907).—This publication contains tables giving particulars of three experiments in regard to the effect of manures on the potato crop:—(1) Experiment at Newhouse Park Farm, St. Albans, in 1905; (2) another experiment at the same place in 1906; and (3) an experiment at Barrow, Bury St. Edmunds, in 1905.

Manuring of Potatoes (Armstrong Coll., Newcastle-upon-Tyne, Coll. Bull. No. 5).—Experiments in the manuring of potatoes were conducted at four centres in Durham during 1906, for the purpose (1) of ascertaining the most necessary class of manure at these centres, (2) of testing the value of potash from different sources; and (3) of comparing the effect of dung and artificials. The plan of manuring was the same as in the three previous seasons. The results obtained show that while nitrogen and potash usually prove the most important ingredients, the omission of any ingredient from the complete dressing may cause a reduction in the crop. When potatoes are manured with artificials, therefore, a complete dressing, such as 1½ cwts. nitrate of soda, $\frac{7}{8}$ cwt. sulphate of ammonia, 3 cwts. superphosphate, and 1 cwt. muriate of potash is to be recommended. Sulphate of potash may be substituted for the muriate, and this has proved on the average of three seasons to be the best potash manure, though there does not seem to be much to choose between them. Dung alone, in 1906, gave a better crop than any of the artificial dressings, but the profit obtained from it was exactly the same as from the complete artificials containing sulphate of potash. Dung and artificials did not, with the exception of one plot, give profitable results compared with dung alone, or compared with complete artificials alone. There was an increase in the crop from the combined dressing, but the extra cost prevented any extra profit being obtained. The best crop of all, however, was obtained from a plot receiving 12 tons of dung and the dressing mentioned above without the potash. This plot also gave the largest gain.

Manuring of Potatoes (Beds. C.C., Agric. Education Com., Rept. on Demonstration Plots, 1907).—Manurial trials were carried out at two centres. The conclusions arrived at were (1) that 12 tons of London peat moss manure, with 1 cwt. sulphate of ammonia, 3 cwt. superphosphate, and 4 cwt. kainit is as profitable as 24 tons of London manure, the yield being practically the same. The London manure was valued at 6s. per ton, half of which was charged against the crop. (2) London manure by itself is more valuable than artificials by themselves. (3) Sulphate of ammonia and superphosphate are more valuable than nitrate of soda and basic slag. (4) Potatoes require nitrogenous manures more than phosphates or potash. (5) Neither soot nor lime alone is profitable. (6) Kainit proved the best potash manure this season, but in previous years the sulphate of potash was the best. This may be accounted for by the cold, dull season. Several of these results were confirmed by the trials at the other centre.

Varieties of Potatoes (Harper-Adams Coll., Field Expts., 1907).—Trials were made of four Early, four Second Early, and ten Maincrop varieties. Of the early varieties, Epicure was ready for lifting first and produced the largest amount of saleable potatoes, but when cooked it was very watery. Of the Second Earlies, British Queen and Colleen produced good crops. The latter is a promising Irish variety; it was free from disease and cooked well. Up-to-Date, Factor, and Warrior were at the top of the Maincrop varieties. A cooking test was made of six varieties. Two potato trials were also made on farms in Staffordshire.

Varieties of Potatoes (Cambridge Univ., Dept. of Agric., Guide to Expts., 1907).—Tables are given showing the results of twelve tests of varieties of potatoes carried out in 1903, 1904, 1905, and 1906.

Varieties of Potatoes (Univ. Coll. of Wales, Aberystwyth, Dept. of Agric., Rept. on Expts., 1906).—Twenty-two varieties of potatoes were grown. These trials have been in progress for several years, and in 1905 the Dalmeny varieties yielded such heavy crops that it was considered advisable to try a larger number of them in 1906. The manures applied were 12 tons dung, $\frac{1}{4}$ cwt. sulphate of ammonia, 3 cwt. superphosphate, and $\frac{1}{2}$ cwt. of sulphate of potash. The best results were obtained with Dalmeny Radium, Dalmeny Acme Kidney, Dalmeny Empress Queen, British Queen, Beauty of Bute, and Dalmeny Hero. A cooking test was made of most of the varieties.

Varieties of Potatoes (Monmouthshire Education Com., Potato Trials, 1907).—These trials were carried out at White House Farm, Llanfair, Abergavenny, and the results are given of the produce from 18 selected tubers of 30 varieties and from 28 lb. of seed from 15 varieties. A cooking test was also made.

Varieties of Potatoes (Univ. of Leeds, Agric. Dept., Bull. Nos. 63 and 70).—The relative merits of a number of varieties of potatoes have been tested at the Garforth Farm for a number of years, and these Bulletins give the results for 1906 and 1907. As regards early potatoes the best results were obtained in 1906 from Midlothian Early, Harbinger, Sir John Llewelyn and Recorder. In 1907 Harbinger gave the lowest yield and it was considered unsuited to the conditions prevailing at Garforth. The best Second Early varieties were British Queen II, an improved type of the old British Queen, and Dalmeny Radium, which is also of the British Queen type. A cooking test was made and British Queen II was considered the best, but there was practically little difference between the other varieties. The seed of all the varieties was grown at Garforth from seed obtained from the raisers in the preceding year. As regards Maincrop varieties, Duchess of Cornwall, Factor, Dalmeny Beauty, Wonder, Dalmeny Regent, and Up-to-Date were among those giving the best results. These are all of the Up-to-Date type, and it is noted that this is still the best type of potato for a farmer to grow, notwithstanding the unfortunate fact that it is comparatively liable to disease. Northern Star proved a vigorous grower in 1907 and was very resistant to disease.

Trials were made in 1907 of three disease-resisting varieties, viz., Apollo and Prof. Wohltmann, two German varieties, and Daisy, a Dutch variety. Seed of Prof. Maercker, another German variety, was also included. The wet season and other circumstances made the test a genuinely severe one, but no disease was observed. On the other hand, the yields were comparatively poor. The trials will be repeated with seed saved from these crops.

Varieties of Potatoes (Cumberland and Westmorland Farm School, Eleventh Report, 1907).—Seven varieties were grown, and the best results were obtained with Scottish Triumph, Dalmeny Beauty and Dalmeny Acme, all of which were but little diseased, while four other Dalmeny varieties were more or less attacked.

Varieties of Potatoes (Beds. C.C., Agric. Education Com., Rept. on Demonstration Plots, 1907).—Experiments were carried out at three centres on small plots. Among the late varieties, Scottish Triumph, Table Talk, Up-to-Date, Northern Star, and Factor, which have occupied the first five places in these experiments for the previous three years, are again well to the front. A variety which appears to be as good as these is Dalmeny Radium, which has for two years been the best of the newer kinds.

Varieties of Potatoes (Univ. Coll. Reading, Agric. Dept., Bull. 2, 1907).—In 1905 and 1906 about sixty varieties of potatoes were grown at the College Farm with the object of determining the degree of difference in botanical and other features among the recently introduced kinds. They were divided into four groups—viz., Up-to-Date, Maincrop, Imperator, and Abundance. The largest yield per ounce weight of set was obtained from the Up-to-Date type, and the next best from the Imperator group. In the majority of cases there was a very decided decline in yield in the second season, and the varieties of the Maincrop group suffered most in this respect.

So far as botanical features were concerned, the varieties named in each group could not be distinguished from each other with certainty. In the Up-to-Date group there appeared to be two slightly different types. It is observed in the Bulletin that for practical purposes “the name of the variety matters little or nothing, and the grower would not suffer if nine-tenths of the names were dropped altogether. So long as a grower obtains a potato belonging to the Up-to-Date group, for example, he may call it what he likes without fear of affecting its yielding power. What does matter, however, is the history of the seed, whether it is from Ireland or Scotland, how long it has been grown on the same farm or in the same district, and how long it has been treated from a cultural point of view.”

Varieties of Potatoes (Univ. Coll. of North Wales, Bangor, Bull. 10, 1906, Bull. 4, 1907).—In 1906 fifteen varieties of potatoes were grown, some from fresh seed and some from home-grown seed. The difference between the yields, in two instances where the same variety was grown, was very marked. Up-to-Date gave the highest yield from Scotch seed; but of the new varieties tried, viz., Table Talk, Highlander, Premier, and Dalmeny Regent, yielded very well. In 1907 Highlander stood lower on the list, but good yields were obtained from the other varieties, as well as from Warrior, Duchess of Cornwall, and Dalmeny Beauty. A cooking test was made in both years.

Planting Potatoes (Camb. Univ. Dept. of Agric., Guide to Expts., 1907).—The Report contains tables showing the results of the following experiments:—(1) Effect of cutting sets; experiments at Burgoyne's Farm in 1903 and 1904. (2) Effect on yield of size of potato sets, and cutting potato sets; trials at Burgoyne's Farm, 1905. Under this head is included an experiment with Discovery potatoes for the purpose of ascertaining whether the value of a large set is due to the store of food or to the greater vigour of the “eye.” Eyes were scooped out so as to leave little adhering flesh, and were started under glass before planting out. The results showed that the

single "eyes" gave smaller yields than the whole sets, and that the yield varied in proportion to the size of the tuber from which the eye was taken, the eyes from large tubers giving better results than eyes from small ones. (3) Effect of cutting potato sets on yield ; trials at Burgoyne's Farm, 1906. (4) Large *versus* small sets ; trials at Burgoyne's Farm in 1904. (5) Effect of size of sets, wide and close planting, sprouting in trays, and growing in the pit, upon the yield of potatoes grown at Burgoyne's Farm in 1906. (6) Effect of change of "seed" on the yield of potatoes, and the effects of sprouting and exposure of sets at Burgoyne's Farm in 1905. (7) Effect of change of "seed" on the yield of potatoes in 1906. The effect of changes was very marked. Immature old seed produced a slight, but by no means marked improvement. In general, seed one year from Scotland was equal to fresh seed ; but in the case of Northern Star this was distinctly not the case. (8) Effect of change of "seed" on the potato crop grown at Ramsey in 1906. Some observations are made on the precautions which experience has shown to be desirable in carrying out potato experiments on small plots.

Planting Sprouted Tubers (*West of Scotland Agric. Coll., Bull. No. 43*).—This experiment was begun in 1906 on the College Farm to discover whether the sprouting of potato seed before planting would give increases of crop similar to those recorded in other trials. The varieties grown were Up-to-Date, British Queen, Langworthy, and Scottish Triumph, and one-half of the seed tubers were put into boxes for sprouting, and the remainder kept in covered pits. The conclusions drawn from the experiment are (1) that the yield of late potato crops can be greatly and very profitably increased by the sprouting of the tubers prior to planting ; (2) that the amount of increase got by sprouting the tubers varies with the variety of potato grown ; (3) that varieties that ripen late in the season have their yields increased in a greater degree than those that complete their growth at an earlier period ; (4) that on soils capable of growing potato crops of 10 to 12 tons per acre, the cultivation of small yielding varieties like the Langworthy is not nearly so profitable as that of more productive varieties, such as the Up-to-Date, British Queen, and Scottish Triumph.

Planting Potatoes. Whole versus Cut Sets (*Univ. Coll. of Wales, Aberystwyth, Dept. of Agric., Rept. on Expts., 1906*).—In this experiment whole sets gave the largest yield, and the effect of cutting both medium and large sets proved, at any rate in a wet season such as that of 1906, to be unsatisfactory, even when the cut sets were planted closer together. It is intended to repeat the experiment on a more extensive scale.

Planting Potatoes. Importance of Careful Sprouting (*Harper-Adams Agric. Coll., Field Expts., 1907*).—It is pointed out in this Report that home-grown seed is often in a very bad condition at planting time. This is due to the method of storing, which often results in the best and strongest sprouts being lost through the seed being kept in clamps, where it is allowed to produce long colourless sprouts. These must be rubbed off before planting, and the set is consequently weakened. To show how much is lost by careless preparation of seed, two lots of Ninetyfold and two of British Queen were planted together. The first sprout was retained in one lot of each variety, and the sprouts rubbed off before planting the other plots. As was expected, the sprouted seed was through the ground first and grew well ahead of the other ; the yield obtained was decidedly greater.

Planting Potatoes. Sprouting Seed Potatoes in Boxes (*Univ. of Leeds, Agric. Dept., Bull. No. 63*).—Past experiments (see *Journal*, February, 1905, p. 673, April, 1905, p. 34, and March, 1906, p. 736) on the boxing of potatoes have shown that where early planting of Second Early and Late varieties was not possible, boxing would be followed by profitable results. The system was further tested in 1906, and a table is given of the results.

Planting Potatoes. Size and distance apart of "sets" (*Univ. Coll. of North Wales, Bangor, Agric. Dept., Bull. 4, 1907*).—This experiment was intended to test the effect of planting (1) seed of different sizes and (2) cut seed. The small seed and the cut seed required 1 ton to plant an acre, the large seed required 2 tons. The results showed that the cut seed yielded some half-ton more per acre than the small seed. Professor Winter observes that many farmers are averse to planting cut potatoes, but "we have never known the cutting, if properly performed, to interfere with the crop. It should be done either on the same day the potatoes are to be planted or on the previous day. Some like to dust the cut potatoes over with quicklime to prevent the escape of juice. That, however, is not a matter of much importance. Trouble is often caused by putting the cut sets in heaps, with the result that they get heated, and many of them do not grow. When cut they should be spread out in a thin layer on a floor."

The large seed produced over a ton of marketable potatoes more than either of the other plots. As the seeding of this was at the rate of a ton per acre more than that of the other plots, the increase from the use of large seed was small.

The effect of planting potatoes at different distances apart in the rows was also tested. Up-to-Date potatoes were planted 12, 15, and 18 in. apart, the rows being 26 in. in width. Where the sets were planted 15 in. apart, the yield was about 15 cwt. per acre more than where they were only 12 in. apart, but there was a decrease of 2 tons with the wider interval.

Irish Seed Potatoes (*West of Scotland Agric. Coll., Bull. 43, Univ. Coll. of Wales, Aberystwyth, Dept. of Agric., Rept. on Expts., 1906; Univ. Coll. of North Wales, Bangor, Bull. 5, 1906, Bull. 3, 1907; Univ. Coll. Reading, Agric. Dept., Bull. 2, 1907; Univ. of Leeds, Agric. Dept., Bulls. 63 and 70; Harper-Adams Agric. Coll., Field Expts., 1907; Beds. C.C., Agric., Educational Com., Rept. on Demonstration Plots, 1907*).—By an arrangement with the Irish Department, experiments were carried out at these centres and elsewhere, to compare the value of Irish seed potatoes with English and Scotch seed. Reports on these experiments are given in the above Bulletins, and the complete results were summarized in the *Journal of the Irish Department of Agriculture* for January, 1908. (See *Journal of the Board of Agriculture*, March, 1908, Vol. xiv, p. 731.)

The average results show that with the variety British Queen, planted in England, Irish seed has given a slightly higher yield than Scottish seed; in the Welsh tests, however, the Scottish seed shows a slight advantage. With the variety Up-to-Date the reverse is the case, the Scottish seed giving slightly higher yields in England, whereas the Irish seed has produced heavier crops in Wales. With the exception of the comparison of Irish and Scottish Up-to-Date seed grown in Wales, the average yield from Scottish and Irish seed did not vary by more than 5 cwt. per acre. This is considered to confirm the opinion held by the Department and many growers to the effect that Irish seed, if not superior, is at least equal to Scottish seed for

planting in England and Wales. As regards the comparison with English seed, it is stated to be clearly evident that Irish seed will produce much heavier crops, even when the English seed is changed from one district to another, as was necessarily the case in these experiments.

Change of Seed (Univ. Coll. of Wales, Aberystwyth, Dept. of Agric., Rept. on Expts., 1906).—A small trial was arranged with a view of determining whether the practice of introducing fresh seed every year or every other year the more profitable. So far as one year's trial is concerned, the balance is in favour of keeping a variety for more than one year before making a change.

Change of Seed (Univ. Coll. of N. Wales, Bangor, Agric. Dept., Bull. 3, 1907).—Experiments to show the effect of change of seed on the potato crop were carried out at six centres. The variety used was the Up-to Date, the seed being obtained from Antrim, Lincolnshire, and Midlothian, and compared with home-grown seed. The English, Scotch, and Irish seed all gave better results than the home-grown seed, except at two centres. At one of these there was little difference between the yield; at the other, the potatoes which were being grown on the farm for the second year gave decidedly better results than the new seed. The average yields at the six centres were as follows:—Home-grown seed, 8 tons; English seed 9 tons 13 cwts.; Scotch seed, 9 tons 2 cwts.; Irish seed, 11 tons.

It is pointed out that the terms English, Scotch, and Irish are apt to be misleading, as other seed obtained from other parts of those countries might give very different results. A table is given showing the varying yields obtained from Up-to-Date seed grown in different parts of England. An experiment was carried out by former students on 18 different farms to compare Up-to-Date seed from Ireland with home-grown seed. The average yield was 2½ tons greater from new seed than from the old seed.

Change of Seed and comparison with immature Seed (Harper-Adams Coll., Report on Field Expts., 1907).—Seed was obtained from Dumfries, East Lothian, Forfar, Cork, Antrim, and Lincolnshire, and compared at two centres with seed grown in Shropshire, both mature and immature. Another experiment was planned to compare East Lothian seed with immature home-grown seed, and it will be repeated on a larger scale in 1908. A table is given showing the results obtained with seed obtained from the trials of English, Scotch, and Irish grown potatoes in 1906. A comparison is also made between (1) a plot of Eldorado from a stock subjected to intensive propagation, and (2) a plot of the same variety planted with a stock that has been propagated in the usual way.

Effect of change of Soil on productiveness of Seed; mature and immature Seed (Univ. of Leeds, Agric. Dept., Bulls. 63 and 70).—Experiments have been made to test the effect of a change of soil on the same farm, and also a change from another part of the same county. The results are not very definite, but it is inferred that a farmer will gain little by adopting either of these methods of "changing" seed.

The trials with mature and immature seed did not generally show any definite advantage in favour of immature seed, and it is observed in the Bulletin that judging by these results, it is questionable whether a farmer would be well advised in trying to restore vigour to his potatoes by growing immature seed, when by frequently introducing suitable changes of seed he is practically certain of reaping distinct advantages.

OFFICIAL CIRCULARS AND NOTICES.

The following memorandum, which has been issued as a leaflet, No. 217, has been prepared chiefly for the information of the local authorities concerned in the administration of the Allotments Acts, but it will also be useful to applicants for small holdings and other persons interested in the Acts.

The Local Authorities who are responsible for the provision of Allotments in urban areas are the Borough or District Council, and in rural areas the Parish Council, or the Parish Meeting where there is no Parish Council.

The Administration of the Allotments Acts.

The first step to be taken by Councils in regard to the administration of the Allotments Acts is to institute an enquiry, either informally through individual members of the Council or by the publication of posters or advertisements

in the local press, with a view to ascertaining whether there is any unsatisfied demand for allotments for the labouring population resident in their administrative area, and inviting applicants to apply to the Clerk of the Council.

The Acts empower Councils to provide allotments up to five acres in size, but there is no obligation on them to provide allotments of more than one acre.

Allotments may be provided for persons of either sex belonging to the labouring population resident in the borough, district or parish.

The term "labouring population" is not defined, and might be held to include only those persons whose main occupation involves manual labour. Tradesmen, licensed victuallers or employers of labour, or persons such as clerks whose main occupation is manual work but not manual labour, would be excluded by this construction, but in dealing with field gardens and similar small allotments, local authorities seem sometimes to have adopted a wider construction, and let the gardens or allotments to all persons of the working classes to whom they would be of real value, and in the absence of any authoritative decision councils would seem justified in doing this.

When the applications have been received and have been examined to ensure that they are *bona fide*, the Council should proceed to ascertain from the local landowners whether they are prepared to sell or let land to the Council. If so, the Council should endeavour to come to terms with the landowners as to the price to be paid or the rent to be charged.

No land may be acquired for allotments except at such a price or rent as will, in the opinion of the Council, permit of all expenses being recouped out of the rents to be obtained from the allotments. The rents to be charged for the allotments must, therefore, be sufficient to cover all the expenses to which the Council are put in acquiring and adapting the land, with a sufficient margin to cover bad debts and the cost of collection. The land may be improved and adapted by draining, fencing, &c., and cottages and buildings may be erected or existing buildings adapted, but not more than one cottage may be erected for occupation with any one allotment, and no cottage may be erected for occupation with any allotment of less than one acre. Councils will be well advised to satisfy themselves before erecting cottages on small allotments that it will be possible to let them readily at sufficient rents to cover the cost of their erection.

If a Parish Council decide to purchase the land, they should obtain the consent of the Parish Meeting and apply to the County Council and to the Local Government Board for their sanction to the raising of a loan for the purpose.

Councils can borrow money in accordance with the provisions of the Local Government Act, 1894, for a period not exceeding 60 years, or from the Public Works Loan

Commissioners, Old Jewry, London, E.C., for a period not exceeding fifty years, the latter being the better course as the Council would probably be able to get the money on more favourable terms. The rate of interest at present charged by the Commissioners is $3\frac{1}{2}$ per cent. for loans for a period not exceeding thirty years and $3\frac{1}{4}$ per cent. for loans for a period between thirty and fifty years.

By Section 11 of the Local Government Act, 1894, Parish Councils are not permitted to raise for general expenses a sum exceeding the amount of a rate of $3d.$ in the pound without the consent of the Parish Meeting, or of $6d.$ in the pound if such consent is obtained, and the general expenses to which these limits apply include the amount of any annual charge, whether of principal or interest in respect of any loan. Any money borrowed by a Parish Council for the acquisition, improvement or adaptation of land for allotments is not, however, to be reckoned as part of the debt of the parish for the purpose of the limitation on borrowing under Section 12 of the Local Government Act, 1894, which restricts the total outstanding loans of a Parish Council to one half of the assessable value of the parish.

With the consent of the Board of Agriculture and Fisheries a Council may let allotments to co-operative associations formed for the purpose of creating or promoting the creation of allotments. The Board have drawn up rules which they will require every association to adopt, and these rules and further particulars may be obtained from the Secretary of the Agricultural Organisation Society, Dacre House, Dacre Street, Westminster, London, S.W.

Councils may make regulations dealing with the terms and conditions on which allotments will be let by the Council, subject to the confirmation of the Board of Agriculture and Fisheries, and draft model regulations have been prepared by the Board. Councils should accordingly consider the advisability of making such regulations, if they have not already done so, and should submit them to the Board for provisional sanction prior to steps being taken to advertise them in accordance with the provisions of Section 184 of the Public Health Act, 1875.

A register showing particulars of the tenancy, acreage and rent of every allotment, let or unlet, and separate accounts of receipts and expenditure under the Allotments Acts are required to be kept by a Council.

Common pasture may, if the Council consider desirable, be acquired by the submission to the County Council of a scheme for its provision, the County Council authorising the acquisition of the land in the same manner as if it were acquired for allotments. A sufficient charge must be made for the use of the common pasture to cover the cost of acquisition.

The Acts also give power to a Council to acquire land or grazing rights for the purpose of providing grazing rights to be attached to allotments provided by the Council.

Councils can acquire land for allotments outside their borough, district or parish. If suitable land cannot be acquired by agreement, a Parish Council may represent the case to the County Council who may, on behalf of the Parish Council, exercise powers of compulsory acquisition under an Order of the Board of Agriculture and Fisheries. No part of any holding of fifty acres or less can be compulsorily acquired. Borough and Urban District Councils are themselves empowered to acquire land compulsorily for allotments under an Order of the Board of Agriculture and Fisheries. Regulations dealing with the compulsory purchase and hiring of land have been prepared by the Board and may be purchased, either directly or through any bookseller, from Messrs. Wyman and Sons, Ltd., Fetter Lane, Fleet Street, London, E.C., price $1d.$ per copy, or post free, $1\frac{1}{2}d.$

In many rural parishes there is land which was set out under Inclosure Awards to be let as field garden allotments. If such land has been transferred to the Parish Council under Section 6 (4) of the Local Government Act, 1894, Section 23 (2) of the Small Holdings and Allotments Act, 1907, enacts that the provisions of the Allotments Acts as to management, letting, application of rents, &c., shall apply to it, and the provisions of the Inclosure Act and Award are superseded. Such land may therefore

now be let in holdings up to five acres each, or, if the land is inconveniently situated, it may be sold and the proceeds devoted to the acquisition of more suitable land elsewhere. By these means it should be possible to turn such land to greater advantage than has been possible hitherto.

If a Parish Council or the Council of an Urban District (not being a borough) fail to fulfil their obligations it becomes the duty of the County Council to intervene. The County Council can then provide allotments up to one acre at the expense of the defaulting authority, and can deal with applications for over one acre of land under the Small Holdings Acts.

The Board of Agriculture and Fisheries is the central authority under the Allotments Acts except as regards questions of finance which are under the jurisdiction of the Local Government Board.

The following Memorandum on the Railway Fires Act has been issued as Leaflet No. 212 :—

**Railway Fires Act,
1905.**

The Board consider it desirable to draw the attention of farmers and others to the provisions of the Railway Fires Act, 1905, which deals with damage by fires caused by sparks or cinders from railway engines.

The Act, which came into operation on 1st January, 1908, provides that when damage is caused to agricultural land or to agricultural crops by fire arising from sparks or cinders emitted from any locomotive engine used on a railway, the fact that the engine was used under statutory powers shall not affect liability in an action for such damage ; but this provision does not apply in the case of any action unless the claim for damage is £100 or less.

The expression "agricultural land" includes arable and meadow land and ground used for pastoral purposes or for market or nursery gardens, and plantations, woods and orchards, and also includes any fences on such land, but does not include any moorland or buildings ; and the expression "agricultural crops" includes any crops on agricultural land, whether growing or severed, which are not led or stacked.

Section 2 provides that a railway company may enter on any land and do all things reasonably necessary for the purpose of extinguishing or arresting the spread of any fire caused by sparks or cinders emitted from any locomotive engine.

It also provides that a railway company may, for the purpose of preventing or diminishing the risk of fire in a plantation, wood or orchard, enter upon any part of the plantation, wood or orchard, or on any land adjoining thereto, and cut down and clear away any undergrowth, and take any other precautions reasonably necessary for the purpose ; but they must not, without the consent of the owner, cut down or injure any trees, bushes or shrubs.

A railway company exercising powers under this section must pay full compensation to any person injuriously affected by the exercise of those powers, including compensation in respect of loss of amenity.

The Act does not apply in the case of any action for damage by fire brought against any railway company unless notice of claim and particulars of damage, in writing, shall have been sent to the railway company within seven days of the occurrence of the damage as regards the notice of claim, and within fourteen days as regards the particulars of damage.

Light railways and tramways worked by steam power are within the scope of the Act.

In connection with the Census of Production, which is being taken this year under the Census of Production Act, 1906, the Board of Agriculture and Fisheries are endeavouring to obtain particulars of the area of woodland on the 4th June last, and of the production of timber during the previous twelve months. Occupiers of woodlands are asked to furnish the present acreage if it differs from that returned in 1905, when a special enquiry

Census of Production.

was last made, the acreage carrying each kind of tree, and number of trees of each kind felled, or sold standing, with the quantity and value of the timber in each case for the year ending 4th June, 1908. The adoption of this period is necessary for the purpose of correlating the results of the enquiry with the returns of other products of the land.

An endeavour is also being made to obtain fuller details relating to the hop crop of the present year than is available from the ordinary agricultural returns. The further information desired relates not only to the acreage and production of hops, but also to the number of extra persons ("hoppers") engaged in picking. As regards these latter, the Board are asking for as close an estimate as possible of the numbers, distinguished by sex and age.

An account of the objects aimed at by the Census of Production was given in this *Journal*, May, 1908, p. 81.

The Board have issued the following circular letter, dated 6th October, 1908 (A¹⁷²_C), to the local authorities in Great Britain

for the purposes of the Fertilisers and Feeding Stuffs Act, 1906.

Circular as to the Fertilisers and Feeding Stuffs Act, 1906.

SIR,—I am directed by the Board of Agriculture and Fisheries to ask you to bring before your local authority the following observations on some of the points that have arisen in connection with the administration of this Act:—

Statements made by Analysts.—It has been brought to the notice of the Board that in some cases official agricultural analysts add to their certificates under this Act statements as to the amount of compensation that should, in their opinion, be allowed in respect of a deficiency of the guaranteed constituents.

In cases where the certificate is not required to be in the prescribed form, that is to say, when the sample is not sent to the analyst in duplicate, there is nothing in the Act to prevent the analyst adding such statements to the certificate, provided the local authority have no objection; and it appears to the Board that the addition in these cases of such information as the analyst feels disposed to give would encourage farmers to avail themselves of the facilities for analysis offered by the Act, and to co-operate with the local authority in the detection of any fraud that may exist. But the Board are advised that those certificates which are required to be in the prescribed form, and which under the Act are made sufficient evidence of the facts therein stated, should not contain any statement not provided for in the prescribed form, as the insertion of such statement might prejudice any proceedings taken on the certificate.

Sampling of articles exposed for sale.—An official sampler can, under Section 3 (2) of the Act, without going through the form of purchase and without giving notice, take a sample of goods exposed for sale; but no proceedings for an offence under Section 6 (1) (b) of the Act can be taken against the person exposing the goods for sale on such a sample.

It is doubtful whether the Act authorises councils to spend money in purchasing fertilisers and feeding stuffs; but in some districts it is the practice to do so for sampling purposes, and in cases where an official sampler has purchased a fertiliser

or feeding stuff exposed for sale, there is nothing to prevent him giving the retailer three days' notice of his intention to sample the article at some premises stated in the notice, so as to be in a position to institute proceedings if the invoice or description given by the seller is false.

The Board think that the compulsory provisions for taking samples contained in Sections 3 (2) and 8 of the Act would be of use in the following circumstances :—

- (a) Where it is considered desirable to obtain information as to the nature of articles supplied to a retailer.
- (b) Where an official sampler suspects that a manufacturer or wholesale dealer is supplying a retailer with goods of such composition that an offence arises under the Act, he can, under this provision, procure a sample of the goods without obtaining the consent of the retailer. And if the sample were taken within the prescribed period and three days' notice were given to the wholesale dealer, proceedings might be instituted against the wholesale dealer.
- (c) Where an article, bearing a distinctive mark or brand, has been sold in circumstances which constitute an offence under the Act, and the local authority desire to obtain evidence on the question whether the defective sample was exceptional or whether all the stock was of the same character.

Appointment of Official Agricultural Analysts and Samplers.—The Board have not made any regulations under Section 4 (1) of the Act as to the qualifications to be possessed by official samplers ; but they think it clearly undesirable that any person should be appointed as an official sampler who is engaged or interested in any trade, manufacture or business connected with the sale or importation of articles used for fertilising the soil or as food for cattle or poultry ; and it would be convenient if local authorities, when submitting appointments of these officers to the Board for approval, would state that the person appointed is not engaged or interested in any such trade, manufacture or business.

In many cases appointments of official agricultural analysts and official samplers are made for a year. The formalities connected with the making and approval of annual appointments involves the expenditure of an amount of time on the part of the clerical staff of the Board and local authorities which is, in the aggregate, considerable, and I am to suggest that in many cases it would be found more convenient to make these appointments "during the pleasure of the Council," with provision for reasonable notice to the official concerned of any proposed change, instead of for a specified period. The Board understand that the County Councils Association consider that in the case of an official agricultural analyst six months' notice would be reasonable.

Prosecutions.—It would be convenient if, in communicating with the Board with regard to proposed prosecutions under this Act, local authorities would specify precisely the provision or provisions under which it is thought proceedings might be taken, and would let each proposed prosecution form the subject of a separate communication. This communication should include all available information bearing on the question whether the seller has wilfully contravened the Act or has acted negligently or fraudulently, and should contain a statement that the sample was taken in accordance with the Act and Regulations. In the case of proposed prosecutions under Section 6 (1) (b) of the Act, it is desirable that this information should, in view of Section 9 (1) (a) of the Act, reach the Board within five weeks of the date on which the invoice was received by the purchaser.

I am, &c.,

T. H. ELLIOTT,

Secretary.

THE CORN MARKETS IN OCTOBER.

C. KAINS-JACKSON.

The new cereal year began on the first of September in not a little gloom, for the harvest had been delayed for some dozen days by frequent visitations of wind and rain. Happily, there came a change for the better by about the 6th ; first, the wind without the rain, drying the wet sheaves, and then weather calm as well as fine. Conditions grew almost summerlike as September passed into October, and before the end of the month just concluded large deliveries of new grain were practicable, a thing which on the last day of August scarcely any observer would have ventured to forecast. Condition, at first discouraging, has shown of late considerable improvement.

Wheat.—The price of English wheat has been somewhat lower than in the like period (the first two months) of last cereal year, but the willingness to accept rather less money has led to a decidedly increased trade, millers having been remarkably ready buyers at average values, which for the eight completed weeks of the cereal year were 31s. 4d. per 480 lb., against 32s. 10d. in the corresponding period of a twelve-month back. The sales of English wheat at Mark Lane during October were over 22,000 qrs. There has been a good demand for sound Russian, which has commanded 42s. to 43s. per 496 lb. for fine winter or Azima, 41s. for good spring, or Ghirka, type. Russia has shipped at the rate of about 300,000 qrs. weekly, but Continental buyers have acquired the bulk of these exports, and only 140,000 qrs. of Russian wheat are at present on passage to the United Kingdom. The United States have been shipping more freely than Russia, viz., at the rate of about 500,000 qrs. weekly, and, as this country is the principal buyer, the influence exerted is greatly in excess of the Russian. At present 770,000 qrs. are on passage from North America, but this includes Canada. The price of American wheat ranges from 37s. for Durum, the lowest type, to 42s. for new spring. All American is sold per 480 lb., so, too, is Argentine, though La Plata wheat usually attains a natural weight of 496 lb. The price of South American has been about 41s. per qr.; this is a period when supplies fall off prior to new crop shipments in January and February. The residue is apt to fluctuate in price according to the chances which holders may see of unloading the old grain before the new crop begins to menace their position. Of Argentine the shipments have closely approximated to 120,000 qrs. weekly, and there are at present 370,000 qrs. on passage. Australasia is not very well represented at Mark Lane just now; some fine wheat from South Australia is held for 41s. 6d. per 480 lb., but the choice is very moderate. New Zealand wheat can hardly be quoted, and despite the low freights it is difficult to get a quotation from New Zealand. The Australian new crop is apparently of good enough promise to warrant speculative offers to ship it in February, and the terms on which it is obtainable may be averaged at 36s. per 480 lb. arrived at a British port. Argentina is offering to ship new wheat at about the same price. The position of India this season is altogether exceptional. Only one port, Karáchi, is a shipper, the "hinterlands" served by Bombay and Calcutta having no exportable surpluses. The wheat available, therefore, is of two sorts only, the white and red Karáchi, which is grown on the banks of the

Indus and in the Punjab. It is wheat rather favoured by millers, and makes about 40s. per 496 lb.; sometimes a little less is taken for a sample not of ideal cleanliness. Persia and Turkey send a little wheat, for which 38s. per 480 lb. may perhaps be given as a mean value.

Flour..—The top price of London flour remains steady at 33s. per 280 lb. sack. This sort satisfies all the demands of the fancy and confectionery trade as a rule, but Hungarian has special uses for what may be termed confectionery *de luxe* and commands 40s. per sack. The finest type for household bread making, "London whites," fetches 31s. per sack cash *ex* mill, and America offers its best grades, Minneapolis, Duluth, etc., at a parity of value. Ordinary London household flour is quoted 28s. per 280 lb. for cash, and is 6d. lower in the two months 1st September to 31st October. The price of fine country flour is about 26s. per sack, with 24s. accepted for the serviceable type known as "roller whites" and 23s. for the wholesome but comparatively neglected sort made and ground between stones. The quantity of foreign flour on passage is 240,000 sacks or about an average; as usual, the greater proportion is coming from the United States. A good demand for whole meal is reported, and 29s. per sack is paid.

Barley..—The average price of English barley for the eight completed weeks of the cereal year is 26s. 8d. per 400 lb., a price showing some advance on last season. It is, however, impossible to say how much of this barley has been of malting type, sold per 448 lb. and reduced to 400 lb. in conformity with the Corn Returns Act, for purposes of striking an average, and how much of it has been of feeding quality only. The demand for good barley is itself good, and 37s. to 38s. per 448 lb. was readily paid at Blandford for prize samples at the Dorsetshire Annual Show. The fine Moravian barley now offering in London, a sample of which won the prize at the Brewers' Exhibition at Islington, is held for 44s. per 448 lb. or thereabouts. Hungarian barley also exceeds a forty shilling level. The average price recently realised in Kent has been excellent, and this of course has been for English barley. Russian feeding barley at 22s. per 400 lb. is much in evidence at Mark Lane and Bristol, and there is a little Persian offering at 20s. to 21s. per 400 lb.

Oats..—The average price of English oats for the eight completed weeks of the cereal year is 17s. 2d. per 312 lb., a decline of 8d. from the same period of last season. The fall is due largely if not entirely to the unusually large deliveries of weathered grain. Russian oats have fallen from 15s. 9d. per 304 lb. in September to 15s. at the end of October. The shipments from Russia, however, have only averaged 100,000 qrs. weekly, which is below the average. The Argentine shipments have been only about half the Russian, but the new crop is of such high promise (and on a largely increased acreage) that the price of La Plata oats by the end of October had fallen as low as 14s. 9d. per 304 lb.

Maize..—The oldest frequenter of Mark Lane, probably, cannot recall an autumn when no American maize was on sale. The supply has for the last two months been confined to the yellow corn of La Plata, and the round grain of South-Eastern Europe. Prices in September were high, nothing being obtainable under 30s. per 480 lb. During October they were gradually reduced until on the 30th at Mark Lane and Liverpool 28s. to 28s. 6d. per 480 lb. was accepted. This, however, is not a low price. The Argentine shipments averaged 200,000 qrs. weekly, those of South-Eastern Europe 50,000 qrs. weekly. Under the heading South-Eastern Europe the corn trade

ordinarily includes the Black Sea ports of Russia, Roumania and Bulgaria and the Aegean port of Salonica. Some fine white maize from Natal meets with favour at 29s. per 480 lb.

Pulse.—The excellent inquiry for beans and peas at Mark Lane, combined with the small extent of foreign competition, makes it impossible not to regret the limited cultivation of pulse by British farmers. During October 32s. per 504 lb. has been paid for English winter beans, and 34s. per 504 lb. for Maple peas. Good Canadian white peas have been in request at 40s. per 504 lb.

Oil Seeds.—Farmers now-a-days are great buyers of oil seeds, not, indeed, directly but in the form of oil-cake. The price of this latter commodity must needs depend on that of the fattening element in the cake, and it is much to be desired that the importance of the "raw material" of oil-cake should be borne in mind by the great stock or breeding interest. Thus cotton seed which in mid-October was on sale at 140s. per ton has now advanced to seven guineas, and, pending arrivals of the new Argentine crop, linseed also shows a hardening tendency. Present prices for linseed are about 47s. for Russian 98 per cent. pure, and 43s. 6d. for Argentine of the same standard of purity. The weight in either case is 416 lb.

Farm Seeds.—The new English red clover seed is of excellent quality, and is held for 70s. per cwt. France offers at 65s., and Chili offers at 60s., keenly competitive samples; in fact, red clover seed seems to have done well this season wherever grown. White clover seed shows far less uniformity; 60s. per cwt. may be mentioned as a fair price for a sound sample. Lucerne is very dear, 78s. per cwt. being paid on October 30 for some fine samples from the South of France.

Minor Staples.—Barley meal has recently been in request at 8s. per cwt. or thereabouts, malt combs at 80s. to 100s. per ton, and malt screenings at about three guineas. Rice meal has a considerable sale at 100s. per ton. Dari is rather scarce, and 27s. to 28s. per 480 lb. is paid for Indian. Carobs at 100s. per ton are in demand for live stock as an "appetiser." Ground linseed cake has a steady sale at eight guineas per ton, and is of course an extremely valuable fattening food. Pure crushed linseed makes thirteen guineas per ton.

THE LIVE AND DEAD MEAT TRADE IN OCTOBER.

A. T. MATTHEWS.

First Week.—In the first few days of the month the country experienced a spell of hot weather very unusual for the time of year, which was beneficial to the agricultural position in every way. The root crops grew rapidly and the pastures greatly improved. These conditions had a favourable effect on the live-stock markets, affording a check to the over supplies of unripe cattle which for so many weeks had depressed the trade. Really good cattle had become quite scarce, and such a wide range of quotations in the various markets has been rarely seen. The ordinary season for grass-fed beef drawing to a close and many of the cattle available having been marketed prematurely, the first week saw a diminution of this class of supplies and considerable improvement in the tone of most markets. The following advances were officially quoted in the value of first quality Shorthorn beef:—London, 3d.; Newport, 3d.; Leicester, 2d.; Ipswich, 3d.; Lincoln, 3d.; Leeds, 3d.; Wakefield, 1d. and Newcastle, 2d. per 14 lb. Hull was

described as very disappointing and 3d. lower, but nearly all the Scotch markets showed some improvement.

In fat sheep the fluctuations were very similar. At Dorchester a rise of $\frac{1}{2}d.$ per lb. was recorded, at Leicester, $\frac{1}{2}d.$; London, $\frac{1}{2}d.$; Ipswich, $\frac{1}{2}d.$; and Newcastle, $\frac{1}{2}d.$; Scotch markets being affected very similarly. Bristol and Norwich were quoted lower by $\frac{1}{2}d.$ per lb. More important perhaps than these small fluctuations were the much more cheerful tone prevailing and the greater confidence shown by holders of both cattle and sheep.

The dead-meat trade was seriously affected by the hot, humid weather which prevailed over the whole country during the week, and heavy losses were suffered from tainting. Not only were considerable quantities rendered unfit for food, but numbers of carcases were sold at ruinously low prices to escape complete loss. Pork and veal were perhaps the worst affected, but all kinds of meat were a very uncertain trade. By the 7th October, however, there was a change for the better and there was a very firm market for fresh delivered and sound meat. Scotch longsides were unchanged at $6\frac{1}{4}d.$ to $6\frac{1}{2}d.$ and English at $5\frac{1}{2}d.$ to $5\frac{1}{2}d.$, port-killed showing some advance, and American chilled was dearer by $\frac{1}{2}d.$ per lb. than on the last day of September. Supplies of veal were very short and good prices were made, best quality fetching 8d. per lb. There was a better demand for mutton at an advance of $\frac{1}{2}d.$ for Scotch, and $\frac{1}{2}d.$ for English teg carcases, prime Scotch fetching $7\frac{1}{2}d.$ and small English $7\frac{1}{2}d.$ per lb. Dutch lambs, or "tegs," sold well at 7d., but heavy Continental wethers were selling at $5\frac{1}{2}d.$. Pork recovered from the panic prices of the previous week and, being very sparingly offered, experienced a sharp advance to $6\frac{1}{2}d.$ for small, and $5\frac{1}{2}d.$ for larger pigs. The above prices are those of London Central Market.

Second Week.—A manifest improvement in the demand for both beef and mutton set in with the second week, and a more cheerful tone prevailed in nearly all the markets. Generally speaking there were reports of some slight alteration for the better in the condition of the animals, though complaints on this head still came to hand from many quarters. With only one or two exceptions there was more willingness to buy, and the following markets were actually quoted higher, taking as our guide the best quality of Shorthorns:—London, 4d.; Ashford, 3d.; Newport, 4d.; Hull, 6d.; Leeds, 3d.; Wakefield, 2d. per 14 lb. stone; and York, 6d.; Darlington, 1s.; Inverness, 1s. 2d.; Stirling, 1s. 4d. per live cwt. Edinburgh declined 1s. 3d., and Glasgow 2s. per live cwt. Prices in London on the 12th were no higher for cattle other than Shorthorns, but this breed, which had been very badly represented in this market for several weeks, showed a sufficient improvement to justify an advance of 3d. per 14 lb. stone in the quotations. The sheep trade also showed unmistakeable signs of recovery, though to a less marked extent than that for beef. In London there was a firm trade, and a clearance made, and at Bristol prices improved $\frac{1}{2}d.$ per lb. for Downs; Shrewsbury, $\frac{1}{2}d.$; Leicester, $\frac{1}{2}d.$; Ipswich, $\frac{1}{2}d.$; Norwich, $\frac{1}{2}d.$; and Crewe, $\frac{1}{2}d.$. At Dorchester, Derby and Newcastle a small decline was recorded. The pig trade was very irregular, owing, doubtless, to the state of the weather. In view of the revival of trade in fat stock in almost every part of the country, the state of the dead-meat markets was a disappointment, especially as regards mutton. Scotch beef indeed, more than held its own. It has maintained its normal quality much better than English during this trying season, and has therefore held a commanding position in the London market. During the second week in

October its price was advanced by $\frac{1}{4}d.$ per lb., short sides fetching $7\frac{1}{2}d.$ and long sides, $6\frac{3}{4}d.$ per lb. English was fairly firm, and there was some improvement in the price of second quality. Deptford killed was firm, but Birkenhead slightly declined. Argentine chilled was $\frac{1}{4}d.$ per lb. cheaper, the best hind-quarters only making $4\frac{1}{2}d.$ against $6\frac{1}{4}d.$ for those from the United States. It was in mutton that the greatest weakness prevailed, nearly all qualities declining sharply. Scotch gave way $\frac{1}{2}d.$, English, $\frac{1}{4}d.$, and Dutch $\frac{1}{2}d.$ per lb.; frozen being unchanged, except Argentine, which rose slightly. This fall in fresh mutton was generally attributed almost entirely to the large supplies of Dutch which, at this time of year, so largely influence the London trade. Veal continued scarce and dear at $8d.$ per lb. for the best Dutch, there being no English at Smithfield good enough to be classed as best quality. Pork was again very weak, the continued high temperature checking consumption.

The London October series of sales of Colonial wool were being held this week and were well attended. Competition was also very brisk up to a certain point, but, except for the finest cross-breds prices were lower by 5 to $7\frac{1}{2}$ per cent. Still, as the sales progressed towards the close, there was increased animation, and wools of good body and staple finished better, and recovered a good deal of the lost ground.

Third Week.—The supplies of cattle at most markets in the third week were similar to those generally available at the end of the grazing season, and complaints were general of the scarcity of first quality animals. There is no doubt, however, that if the markets had been supplied with some good ripe cattle, they would have sold readily enough at better prices, but, as things were, there was a decided check to the upward movement and, in some places, an actual decline. These included Newport, where there was a decided fall of $4d.$ per 14 lb. for first quality Shorthorns, Leeds declining $3d.$, and Wakefield $2d.$. These were more than counterbalanced by Bristol, Ashford, Dorchester and Peterborough, all of which recorded a slight advance. At most of the largest centres the trade was slow but firm at late rates, and amongst these was London, where Shorthorns still sold at $7s. 7d.$ as the top figure, in the absence of any stall-fed bullocks, such as those which have been offering at Ipswich and realizing considerably higher rates. Other breeds shown at Islington made, relatively, more money, fine Devons fetching $8s. 5d.$, Herefords, $8s. 2d.$, and Runts, $7s. 10d.$. The last-mentioned breed is well represented at Islington during the summer and autumn months and, as a rule, they are highly appreciated by the butchers after a season's grazing in the Midland pastures, and nothing could be more conclusive as to the poor quality of the grass this year than the unusual want of finish so plainly visible of late in this hardy and thrifty breed of cattle.

The movements in the markets for fat sheep were somewhat similar to those for cattle, but here again the majority were unchanged in value. Taking the class described as "Downs" as being the most generally representative, we find that at Bristol and Derby there was an advance of $\frac{1}{4}d.$ per lb., while at Shrewsbury, Leicester, Ipswich and York, there was a decline of a like amount. Veal calves of good quality were scarce and realized good prices, but pigs, both bacon and porkers, were very irregular in demand, apparently controlled by local supply and demand.

The dead-meat trade, which had finished very badly the preceding week owing to the abnormal heat, was greatly relieved by the colder winds

and low temperature which set in about the 18th, when a more cheerful and hopeful tone pervaded the market. Scotch beef remained firm at the price recorded last week, and English was firm for the best at $5\frac{1}{2}d.$ per lb. There was, however, a considerable quantity sold as low as $5d.$ The difference between Scotch at $6\frac{1}{2}d.$ and English at $5\frac{1}{2}d.$ is far greater than is usual under ordinary conditions, and points to the exceptionally low quality of the English beef coming to London this autumn. There was a slight rise in Deptford-killed sides and a very great one in Argentine chilled. Hind quarters advanced $10d.$ per 8 lbs. on the week, partly attributed to the arrival of a large consignment of much better quality than usual. American chilled also advanced another $\frac{1}{2}d.$ per lb. and was firmly held for $7d.$ per lb. for the best hind quarters. Veal and pork were very firm and business in the latter was largely done at $6\frac{1}{2}d.$ per lb. Mutton also participated in the general improvement to the extent of $\frac{1}{2}d.$ per lb.

Last Week.—There was a very good trade for beef at Norwich on the Saturday, with plenty of buyers at 8s. 6d. per 14 lb., but sheep were a poor trade and made less money. At Islington there was another wet market day, which prevented what everyone expected, viz., a very good trade. There were nearly 300 more cattle on offer, always a sufficient increase to affect business at this market. Yet, with these adverse influences, prices, except for fat cows, were certainly no worse, and for a very few of the best the official quotations were slightly exceeded. These cases, however, were too rare to justify any claim for a general advance. For instance, eight Shorthorns, weighed after sale, were found to have realized 36s. 2d. per live cwt., while the generally recorded price for the same class of cattle was 34s. 8d. Fat cows were slow to sell at a reduction of $\frac{1}{2}d.$ per lb. There were 5,340 sheep on offer, and trade was fairly brisk in the early morning, but the demand fell away and values at the finish could not be quoted any higher. In fact, Cheviots were quoted $\frac{1}{2}d.$ cheaper. English Down tegs still made $8\frac{1}{2}d.$ per lb., and other sorts were firm. The heavy rain quite robbed the sheep of their blooming appearance and in every way told against the trade.

At the Central Market on the last Wednesday the weather was once more of the very worst character for the meat trade. Fortunately, supplies were moderate, and demand was just sufficiently active to prevent a fall in prices for beef. Scotch was still firm and English unchanged, though the quality of the latter left much to be desired. There were many complaints on this head with regard to the supply of American and Canadian port killed, which included very few indeed of first quality, and a few selected States sides commanded a slight advance on the week. The extreme rates for Argentine chilled given the previous week were not quite maintained, but the best States advanced another $\frac{1}{2}d.$ per lb., bringing hind quarters to $7\frac{1}{2}d.$ per lb. The average of the whole carcase was thus equal to the best port killed, which occurs but rarely.

The mutton trade was again much depressed, and values declined $\frac{1}{2}d.$ per lb. all round except for frozen, and even that was a trifle easier for some descriptions. Veal was slow and declined $\frac{1}{2}d.$, but the trade for pork suffered a severe collapse. Supplies were heavy and demand small owing to the weather, and prices fell to the extent of $1d.$ per lb. The London trade in this article at this season is very uncertain and fluctuating.

Store Stock.—October has been a month of rapid growth for roots and

pastures, and both cattle and sheep have sold quite as well as could be expected in comparison with the price of meat. The latest markets have shown an improved demand for sheep, while cattle of good quality are making at least as much money as last year.

THE PROVISION TRADE IN OCTOBER.

HEDLEY STEVENS.

Bacon.—The month of October has been a trying one for the trade, especially for those handling very mildly cured meats, on account of the extremely mild and humid weather. The consumptive demand continued below the average, and prices for most selections were slightly easier, Canadian sides showing a drop of 5s. to 6s. per cwt., bringing this article more into relation with Danish prices. Killings have been heavier in Canada, so freer arrivals from that country may be expected in the near future. Arrivals from Denmark in London have averaged about 14,000 bales weekly, with the exception of one week, when the total exceeded 17,400 bales. American bacon and hams have experienced a gradual decline in prices during the month, but values are considered to be far too high, and further reductions are generally expected. Some American packers are now offering to contract for the winter supply, but ask prices which English importers refuse to entertain. Arrivals of American have not been heavy or prices would have shown a greater reduction. Some letters from Chicago written in the third week in October report very small killings of hogs. Those coming to that market are still light and poor in quality, and it will be some time, probably two months, before they begin to show the effect of the new corn crop, the quality of which is excellent. There has been a fairly plentiful supply of English pigs, with declining values towards the end of the month. The demand for English bacon has been good, the cheaper pigs enabling curers to compete with Danish and other imports.

Cheese.—All markets have experienced a small demand throughout the month, and merchants generally report that, owing to the adverse conditions, trading has been very unprofitable. Canadian cabled prices for the September and first half October makes were about 60s. at the commencement of the month, but English buyers made a determined effort to break the prices by abstaining from contracting at the extreme figures asked, with a partial result, as stocks increased at Montreal, causing prices gradually to decline. By the middle of the month some shippers were offering finest September-made Brockville and Belleville section lots at 57s. c.i.f. terms, showing a fall in price of 5s. to 6s. per cwt. At the end of the third week a reaction in cabled prices set in, and by the end of the month offerings of a similar description had advanced to 59s.-60s. c.i.f. This had little if any effect on spot trading, buyers being most apathetic. Grocers anticipate bad trade during the winter months, and argue that the consumption of cheese will be much smaller at the present high prices. Also with the probable large arrivals of New Zealand in the spring, their policy is to buy from hand to mouth, instead of contracting ahead as customary. The estimated

stocks of Canadian and States cheese at the end of the month in the three principal distributing ports (London, Liverpool and Bristol) showed a decrease of 5,000 boxes only as against the same time last year, whereas shipments from Canada from 1st May to 17th October to all ports show a decrease of 245,000 cheese against the corresponding period last year. Advices from Canada report that some of the factories in Eastern Ontario and Ottawa Valley closed during the first week in October owing to the very small quantity of milk they were receiving, there being so little grass. Others which ran up to the 15th November last year, were closing, some on the 15th October, and the balance at the end of October. In some other sections, factorymen turned, early in October, to butter making only. Mr. J. A. Ruddick, Dairy Commissioner for the Canadian Department of Agriculture, reports, under date 14th October :—"The continued dry weather has had a marked effect on the milk supply throughout the greater part of Eastern Canada, and the result will be a considerable shortage in the production of cheese."

There has been a fair make of English cheese during October. Some stopped early in the month, more especially in the west and south of England, as the consumptive demand for milk continued good. It is estimated that the make for the season will be about an average, but below last year, when it was abnormal. It has been less in the west and south of England, but that loss has been made up by an increased make in Cheshire. Prices were about the same as last year for the corresponding period, except for Cheshire, which was cheaper.

Butter.—Dealers generally report a dull trade. The cotton strike in Lancashire and widespread unemployment are said to be largely responsible for the depression. The unseasonably mild weather has also affected the consumption, especially of the lower grades. During the third week of the month the first consignment of the new season's make of Australian arrived and realized from 116s. to 122s. It totalled only 840 boxes of 56 lbs. each, as there is always a good home demand for the earliest makes. The following week a parcel arrived from New Zealand, probably partly winter make as well as new season. Prices ranged from 120s. to 124s. Cables from Australia report splendid rains over a widespread area, and production increasing rapidly. High prices are asked for the season's output, at which English buyers demur, preferring to contract for near shipments only.

The trade with Canada during the month has been small, prices being above an export basis. What shipments there have been were mostly summer-made lots, held in cold stores on the English buyer's account, to be shipped out during October. It is anticipated that the Canadians will require all the stock they now have in their country for their winter trade. Shipments of butter from Canada from 1st May to 17th October this year show an increase of over 21,000 packages over the same period of 1907.

The butter trade with the United States of America has been very small during October, their prices being prohibitive.

Eggs.—The month opened with a disappointing demand, and prices favoured buyers. Later supplies were only moderate, and by the end of the month there was a considerable shortage in the supply from the Continent, causing prices to show a smart advance. Germany was reported to be buying freely during the month. Prices for Canadian eggs keep above an export basis.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND
in the Month of October, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—				
Cattle :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Polled Scots	s. d. 8 0	s. d. 7 7	s. d. 39 11	s. d. 35 10
Herefords	7 11	7 8	—	—
Shorthorns	7 10	7 2	38 8	35 0
Devons	8 3	7 6	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
Veal Calves	d. 7 4	d. 7	d. 8 1	d. 6 1
Sheep :—				
Downs	8	7	—	—
Longwools	7 1	6 8	—	—
Cheviots	8	7 1	8	7 1
Blackfaced	7 1	6 4	7 1	6 1
Cross-breds	7 1	7	8	7 1
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d. 6 4	s. d. 5 10	s. d. 6 4	s. d. 5 7
Bacon Pigs	6 9	6 3	6 8	5 11
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s. 21 16	£ s. 18 8	£ s. 21 1	£ s. 17 6
Shorthorns—In Milk ...	21 16	18 8	21 1	17 6
"—Calvers ...	21 13	18 6	20 5	17 4
Other Breeds—In Milk ...	16 12	15 3	20 5	16 13
"—Calvers ...	14 10	14 2	19 10	16 8
Calves for Rearing	2 3	1 14	2 1	1 10
Store Cattle :—				
Shorthorns—Yearlings ...	10 5	8 12	10 14	8 8
"—Two-year-olds ...	13 18	12 9	15 2	12 11
"—Three-year-olds ...	16 12	14 16	15 12	13 18
Polled Scots—Two-year-olds	—	—	16 1	13 8
Herefords— "	14 5	12 15	—	—
Devons— "	15 9	14 3	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs, and Lambs—				
Downs or Longwools ...	35 7	30 4	—	—
Scotch Cross-breds ...	—	—	25 1	21 1
Store Pigs :—				
Under 4 months	22 4	15 7	20 6	15 6

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in
ENGLAND and SCOTLAND in the Month of October, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birming-ham.	Man-chester.	Liver-pool.	Glas-gow.	Edin-burgh.
BEEF :—		per cwt. s. d.					
English ...	1st	51 6	51 6	49 6	51 6	59 6*	58 6*
	2nd	48 0	46 6	46 0	49 0	52 6*	49 0
Cow and Bull ...	1st	42 0	45 6	43 0	42 0	41 0	44 0
	2nd	33 0	41 0	38 0	37 0	36 6	36 6
U.S.A. and Cana-dian :—							
Port Killed ...	1st	53 6	50 0	49 0	51 6	52 0	—
	2nd	48 6	44 6	45 6	47 0	45 6	45 6
Argentine Frozen—							
Hind Quarters ...	1st	37 0	38 6	37 6	37 6	37 6	40 0
Fore " "	1st	31 0	33 0	32 0	32 0	31 0	33 0
Argentine Chilled—							
Hind Quarters ...	1st	47 0	45 6	44 6	44 6	46 6	47 0
Fore " "	1st	32 0	33 6	33 6	33 0	32 6	34 0
American Chilled—							
Hind Quarters ...	1st	63 0	59 6	59 6	59 6	56 6	62 0
Fore " "	1st	40 0	39 6	38 0	38 0	37 6	41 0
VEAL :—							
British ...	1st	74 6	60 6	64 0	71 0	—	—
	2nd	67 0	53 0	57 0	65 6	—	—
Foreign ...	1st	73 6	—	—	—	—	67 0
MUTTON :—							
Scotch ...	1st	67 0	—	65 6	67 0	68 6	63 0
	2nd	64 0	—	60 6	62 0	51 6	52 0
English ...	1st	64 0	66 6	61 6	62 6	—	—
	2nd	59 6	53 0	56 0	57 0	—	—
U.S.A. and Cana-dian—							
Port killed ...	1st	—	57 0	48 0	45 0	—	—
Argentine Frozen ...	1st	33 6	34 6	34 0	33 6	32 6	34 0
Australian " "	1st	31 6	33 0	31 6	31 6	—	—
New Zealand " "	1st	40 6	—	—	42 0	42 0	—
LAMB :—							
British ...	1st	—	61 6	—	—	68 0	60 6
	2nd	—	56 0	—	—	53 0	56 0
New Zealand ..	1st	53 6	54 0	51 6	51 6	55 0	56 0
Australian ...	1st	47 0	48 0	46 0	46 0	—	—
Argentine ...	1st	—	49 0	—	—	—	—
PORK :—							
British ...	1st	56 6	60 0	61 0	61 6	52 6	55 0
	2nd	49 6	54 0	56 0	57 0	50 0	46 0
Foreign ...	1st	55 0	61 0	62 0	62 0	—	—

* Scotch.

AVERAGE PRICES of British Corn per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1906, 1907 and 1908.

Weeks ended (in 1908).	Wheat.			Barley.			Oats.			
	1906.	1907.	1908.	1906.	1907.	1908.	1906.	1907.	1908.	
Jan. 4	28	4	26	0	35	1	24	6	23	11
" 11	28	6	26	1	35	2	24	8	24	2
" 18	28	5	26	1	35	5	24	11	24	1
" 25	28	7	26	2	35	6	25	1	24	5
Feb. 1	28	10	26	3	35	0	25	1	24	4
" 8	28	10	26	6	34	3	25	3	24	5
" 15	28	11	26	7	33	1	25	6	24	1
" 22	28	10	26	10	32	6	25	4	24	2
" 29	28	8	26	9	30	11	25	0	24	2
Mar. 7	28	5	26	8	30	5	25	1	23	11
" 14	28	5	26	10	31	3	24	8	24	2
" 21	28	4	26	10	31	7	24	4	24	0
" 28	28	3	26	8	31	4	24	5	23	9
Apl. 4	28	7	26	9	31	3	24	2	24	3
" 11	28	11	26	8	31	2	24	4	23	9
" 18	29	4	26	8	30	11	24	0	23	3
" 25	29	6	26	10	30	10	24	0	23	3
May 2	29	10	27	0	31	6	23	10	23	6
" 9	30	1	27	6	32	4	24	1	24	0
" 16	30	3	28	4	33	1	23	10	24	9
" 23	30	4	29	7	33	8	24	2	24	3
" 30	30	4	31	4	33	5	22	10	24	0
June 6	30	3	32	0	33	1	23	4	24	7
" 13	30	4	31	10	32	7	23	6	24	7
" 20	30	5	31	4	32	0	22	10	24	11
" 27	30	3	31	2	31	5	24	3	24	6
July 4	30	2	31	3	30	11	23	0	24	8
" 11	30	5	32	0	30	5	23	8	24	10
" 18	30	3	32	6	30	7	23	2	24	6
" 25	30	5	32	11	31	5	22	4	27	3
Aug. 1	30	9	33	2	31	10	22	1	26	4
" 8	30	5	33	5	31	6	23	0	26	6
" 15	29	0	33	6	31	6	24	2	25	9
" 22	27	9	33	7	31	2	25	0	25	0
" 29	26	9	33	10	30	10	24	3	24	24
Sept. 5	26	4	31	11	30	10	24	9	24	2
" 12	25	11	31	4	31	5	24	3	24	4
" 19	25	9	31	5	31	7	24	3	25	0
" 26	25	9	31	8	31	5	24	8	25	3
Oct. 3	26	1	32	6	31	7	25	0	25	5
" 10	26	3	33	3	31	5	25	3	25	9
" 17	26	6	34	4	31	2	24	10	26	3
" 24	26	7	35	9	30	11	24	10	27	5
" 31	26	7	36	3	30	8	24	8	27	7
Nov. 7	26	6	35	10	30	11	24	8	27	8
" 14	26	4	35	1			24	4	27	8
" 21	26	3	34	7			24	1	27	5
" 28	26	1	34	7			24	1	27	5
Dec. 5	26	1	34	7			24	1	27	1
" 12	26	1	34	8			23	11	27	0
" 19	26	3	34	9			24	3	27	1
" 26	26	0	34	6			24	1	26	10

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates : Wheat, 60 lbs. ; Barley, 50 lbs. ; Oats, 39 lbs. per Imperial Bushel.

AVERAGE PRICES of Wheat, Barley, and Oats per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

	WHEAT.		BARLEY.		OATS.	
	1907.	1908.	1907.	1908.	1907.	1908.
France : September	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
October ...	39 10	38 7	25 1	25 9	19 10	19 11
Paris : September	39 10	38 8	25 7	25 11	19 9	20 1
October ...	40 6	39 9	26 8	26 2	20 5	20 7
Belgium : August ...	39 3	39 2	26 3	26 2	19 4	20 8
September ...	35 2	34 5	25 0	25 4	23 3	20 9
Germany : August ...	34 7	34 3	25 11	24 9	20 9	19 7
September ...	45 3	42 11	27 9	27 9	25 4	22 0
Berlin : August ...	46 11	42 1	30 0	29 10	23 8	21 9
September	45 8	43 8	—	—	26 8	22 6
September	48 1	44 3	—	—	24 8	22 9
Breslau : August ..	44 7	43 9	{ 28 11 (brewing)	{ 30 8 (brewing)	{ 24 6	20 6
September	46 7	40 11	{ 26 6 (other) 29 6 (brewing)	{ 26 0 (other) 30 8 (brewing)	{ 24 6	20 10
			{ 26 6 (other)	{ 26 0 (other)		

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets. The mark is now taken as equal to 11·8d., and the German prices for the former year have been recalculated on this basis.

AVERAGE PRICES of British Wheat, Barley, and Oats at certain Markets during the Month of October, 1907 and 1908.

	WHEAT.		BARLEY.		OATS.	
	1907.	1908.	1907.	1908.	1907.	1908.
London... ...	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
... ...	35 5	32 4	27 1	28 10	19 4	17 9
Norwich	33 3	30 8	25 11	27 2	17 9	16 10
Peterborough	34 2	30 2	25 10	27 5	17 8	16 4
Lincoln... ...	34 8	30 3	26 1	27 2	17 11	16 5
Doncaster	33 10	30 4	25 2	26 0	18 2	16 10
Salisbury	33 9	31 6	26 11	28 8	17 8	17 0

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of October, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Bristol.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
BUTTER :—	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
British	per 12 lb. 14 3	per 12 lb. 13 0	per 12 lb. 14 3	per 12 lb. 13 3	per 12 lb. —	per 12 lb. —	per 12 lb. 15 0	per 12 lb. —
Irish Creamery	per cwt. 119 6	per cwt. 115 6	per cwt. 125 0	per cwt. 121 0	per cwt. 121 6	per cwt. 117 0	per cwt. 122 6	per cwt. —
„ Factory	111 6	107 6	107 0	105 0	109 0	101 6	—	—
Danish	127 6	124 6	—	—	128 0	124 6	127 0	—
Russian	111 0	107 6	113 0	108 0	112 0	108 0	111 0	104 0
Canadian	118 0	115 6	120 6	115 0	118 6	115 0	—	—
New Zealand	119 6	118 6	—	—	—	—	—	—
CHEESE :—								
British—								
Cheddar	75 6 120 lb.	67 6 120 lb.	76 0	64 0	72 0 120 lb.	67 0 120 lb.	64 0	60 0
Cheshire	78 6 per cwt.	64 6 per cwt.	—	—	67 0 per cwt.	61 0 per cwt.	—	—
Canadian	61 6	60 6	62 0	59 6	60 6	59 6	62 0	60 0
BACON :—								
Irish	66 0	63 0	—	—	67 0	62 6	68 6	64 0
Canadian	59 6	56 6	64 0	61 0	61 0	58 0	62 6	60 0
HAMS :—								
Cumberland	103 0	93 0	—	—	—	—	—	—
Irish	101 6	93 0	—	—	—	—	102 0	93 6
American (long cut)	55 0	52 6	55 0	52 0	56 0	52 0	56 6	55 0
Eggs :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British	15 2	12 11	13 9	12 8	12 3	—	—	—
Irish	13 4	12 0	11 7	10 8	11 9	10 3	12 1	9 11
Danish	12 9	11 4	12 0	10 11	11 7	11 0	11 10	9 7
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
British Queen	65 0	52 0	68 0	61 0	46 6	41 6	50 0	42 6
Scottish Triumphs	62 6	52 6	61 0	57 6	43 6	38 6	—	—
Up-to-Date	64 0	53 0	65 0	54 6	43 6	38 6	50 0	42 6
HAY :—								
Clover	91 0	73 6	72 6	—	83 0	60 6	65 0	60 0
Meadow	72 0	56 6	65 0	—	—	—	52 6	47 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	OCTOBER.		10 MONTHS ENDED OCTOBER.	
	1908.	1907.	1908.	1907.
Swine-Fever :—				
Outbreaks	169	140	1,762	2,191
Swine Slaughtered as diseased or exposed to infection ...	1,483	855	10,883	10,067
Anthrax :—				
Outbreaks	99	84	921	912
Animals attacked	118	128	1,211	1,222
Foot-and-Mouth Disease :—				
Outbreaks	—	—	3	—
Animals attacked	—	—	112	—
Glanders (including Farcy) :—				
Outbreaks	60	68	691	735
Animals attacked	223	150	2,142	1,675
Sheep-Scab :—				
Outbreaks	16	26	663	447

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	OCTOBER.		10 MONTHS ENDED OCTOBER.	
	1908.	1907.	1908.	1907.
Swine-Fever :—				
Outbreaks	11	19	152	139
Swine Slaughtered as diseased or exposed to infection ...	287	336	3,534	2,414
Anthrax :—				
Outbreaks	—	1	7	3
Animals attacked	—	1	10	5
Glanders (including Farcy) :—				
Outbreaks	—	—	—	5
Animals attacked	—	—	—	9
Sheep-Scab :—				
Outbreaks	23	13	302	212

SELECTED CONTENTS OF CURRENT PERIODICALS.

Annual Report of the Medical Officer of the Local Government Board, 1906-7.
[Cd. 4289].

Bacterial studies of milk from healthy and diseased cows, *W. G. Savage*; Distribution of organisms of the Gaertner Group in the animal intestine, *W. G. Savage*.

Quarterly Journal of Forestry. II. 4.

Working Plan of Stisted Hall Woodlands, 1907-22, *W. K. Fisher*; Notes on the Forests of Switzerland, *Julien Morel*; Fencing, *J. C. Archibald*; Planting and Reclamation of Moors and Bogs in Belgium, *A. P. Grenfell*.

Forestry Quarterly (New York). VI. 3.

On the Course of Prices in Forestry, *E. Bruncken*; The Light Requirements of Forest Trees and the Methods of Measuring Light, *C. Zederbauer*.

Bulletin of the Royal Botanic Gardens, Kew, 1908. 7.

"Die back" of Peach Shoots, *G. Massei*.

Indian Trade Journal. Supplement, 27th August, 1908.

The Calorific and Manurial Values of Indian Cow-dung commercially considered, *E. R. Watson*.

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Heft 7. Neues vom Maikäfer, *Dr. K. Escherich*; Heft 8. Düngungsversuch zu Kiefern auf Hochmoor, *Dr. v. Tübenf*; Heft 9. Beiträge zu den Grundlagen der Züchtung einiger landwirtschaftlicher Kulturpflanzen, *Dr. C. Fruhwirth*; Experimentell-biologische Studien an Borkenhäfern, *Dr. C. Hennings*.

Landwirtschaftliche Jahrbücher. XXXVII. Band.

Heft 6. Untersuchungen über den Einfluss der Ernährung auf die Milchsekretion des Rindes, *A. Buschmann*.

Ergänzungsband III. Erster Bericht vom Dikopshof. Die Einrichtungen und die Versuchstätigkeit auf dem zur Königlichen Landwirtschaftlichen Akademie Bonn-Poppelsdorf gehörigen Gut Dikopshof in den Jahren 1905-07, *J. Hansen*.

Ergänzungsband IV. Beiträge zur Kenntnis der histologischen Erscheinungen bei der Veredlung der Obstbäume, *F. Herse*.

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Untersuchungen über den Einfluss verschieden hohen Wassergehaltes des Bodens in den einzelnen Vegetationsstadien bei verschiedenem Bodenreichtum auf die Entwicklung der Sommerweizenpflanze, *Franz Preul*; Untersuchungen über die durch Hafer in den einzelnen Vegetationsperioden bewirkte Aufnahme und Abgabe von Nährstoffen, *I. Seidler* und *A. Stutzer*; Die Beziehungen der Agrikulturchemie zu den benachbarten Wissenschaftsgebieten, *D. N. Prianischnikow*.

Die landwirtschaftlichen Versuchs-Stationen. LXVIII. V and VI.

Über die absorption des Kalkstickstoffes im Ackerboden, *Dr. H. Kappen*; Weitere Untersuchungen über den Einfluss der nicht-eiweißartigen Stickstoffverbindungen der Futtermittel auf die Milchproduktion, *A. Morgan*, *C. Beger* und *F. Westhauser*; Zur Kenntnis der Faktoren, welche die Düngewirkung der schwerlöslichen Phosphate beeinflussen, *H. G. Söderbaum*.

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ADDITIONS TO THE LIBRARY.

[NOTE.—The receipt of *annual* publications of foreign agricultural and other departments, experiment stations and societies is not noted in the monthly list of additions to the Library, but a list of those publications, which are regularly received, will be published at a later date.]

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Holland—

Overzicht van het Landbouwonderwijs in Frankrijk, België, Groot-Brittannië en Ierland, Denemarken, Zweden, Noorwegen en Duitschland. (153 pp.) Printed privately about 1887.

Meijers, E. M.—Landbouwcoöperatie in Nederland. (172 pp.) Amsterdam : Johannes Müller, 1907.

[Books may be borrowed from the Board's Library on certain conditions, which may be ascertained on application.]

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THE LARGE LARCH SAW-FLY.

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An account of the Large Larch Saw-fly (*Nematus erichsoni*) has already been given in this *Journal*.* In it Packard's account of its life-history as well as the history of the pest in America and Europe, was summarised, but as the insect was practically a new pest, its life-history and bionomics had not been studied in this country. The present paper is intended to supplement MacDougall's account, and contains the results of a study of the life-history, parasites, and natural enemies of the saw-fly, together with recommendations as to remedial and preventive measures resulting from the investigation. The complete manner in which the previous history of the pest is given in Packard's careful description† of its occurrence in the United States of America, and in MacDougall's *résumé*, makes it unnecessary to repeat this information here, and the subject is now taken up at the point at which these authors left off.

The egg, larva, female saw-flies and cocoons have been described, but the male, so far as I am aware, has not been

* MacDougall, R. S. "The Large Larch Saw-fly (*Nematus erichsoni*)."
Journ. Board of Agriculture, vol. xiii, pp. 385-394, 1 pl., October, 1906.

† Packard, A. S. Fifth Report of the United States Entomological Commission,
"On Insects Injurious to Forest and Shade Trees" (*N. erichsoni*), pp. 879-890,
pls. ix and xxvi.

mentioned. Packard does not appear to have seen one. This is no doubt on account of its rarity. *N. erichsoni* has been shown by the present investigation to produce almost solely by parthenogenesis, that is, the larvæ hatch out from eggs which have not been previously fertilised by males. This phenomenon occurs in other species of saw-flies (Tenthredinidae), for example, in the common Gooseberry or Currant Saw-fly, *N. ribesii*. That this form of reproduction takes place was proved not only by segregating the females immediately on their emergence from the cocoons, but also by the fact that out of 300 cocoons which were specially observed only 2 males emerged to 298 females.

Description of Male.—The male is smaller than the female. Its length is 9 mm. and expanse of wings 15 mm. (the female is 11 mm. in length with a wing expanse of 20 to 21 mm.). The terminal portion of the abdomen is broadly rounded. The legs are paler in colour than those of the female, and only a small portion of the distal extremities of the tibiæ of the third pair of legs is dark coloured.

Life-history.—The female saw-flies began to emerge from the cocoons on 27th April (at an average temperature of 55° F.), but the largest number emerged from 29th May to 3rd June. At my request, Mr. Edwards, Forester on the Manchester Waterworks estate at Thirlmere, kindly observed the appearance of the saw-flies in the plantations, and the first was recorded on 1st June, which agrees with the period of maximum emergencies in my experiments. I observed females still on the wing in the Thirlmere district towards the end of July. From this it might be inferred that there were two annual broods, such as occur in certain other species of saw-flies, for example, in the Pine Saw-fly *Lophyrus pini*, but I was not able to obtain two broods in my experimental studies, even from the earliest emerged batches. The emergence of the saw-flies from the cocoons of the previous year under natural conditions extends over a period of about eight weeks, and this fact explains the frequent occurrence of both full-grown and recently hatched larvæ on the same tree, which, together with the presence of the adult saw-flies over such an extended period, might be taken as indicating that the species was double-brooded, in the absence of evidence to the contrary.

The females begin to deposit their eggs almost immediately after emerging from the cocoons, especially if the weather is warm and sunny; as they reproduce parthenogenetically there is no necessity for them to await fertilisation by the male. The eggs are deposited on the stems of the fresh green terminal shoots in small slits made by the saw-like appendages of the ovipositor. The slits are made along the shoots with the result that the green terminal shoot is killed by the numerous wounds and curls round in a characteristic manner (Fig. 3). The presence of these brown and curled dead terminal shoots is often a means of detecting the presence of the larvæ when they do not occur in sufficient numbers to indicate their presence by much defoliation of the twigs. The eggs appear to be deposited chiefly on the lower branches of the trees, as I found that on the trees which were only moderately attacked the larvæ were most numerous on the shoots of the lower branches and these usually showed signs of defoliation before the branches nearer the top of the tree. The beginning of the attack on the lower branches is probably explained by the fact which has already been mentioned, namely, that the females begin to lay almost immediately after emergence; they would naturally on emerging from the cocoons lying beneath the turf, &c., fly on to the lower branches first.

As Packard's detailed description of the different stages of the life-history has been given in a summarised form by MacDougall, I shall not repeat those of my results which are merely confirmatory. In one respect, however, my experiments did not agree with those of Packard. He found that the larvæ moulted three times, that is, there were four larval stages. The larvæ which I reared and kept under observation, several hundreds in number, moulted five times, there being six larval stages. This difference in our results may be due to the fact that the observations were made in different countries, and in the case of saw-fly larvæ, as also in lepidopterous larvæ, one cannot be dogmatic with regard to the number of larval stages. The larvæ hatched out in eight to ten days after the eggs had been deposited. The larval life extended over a period of three to four weeks, each larval stage lasting from three to four days. A typical life-history (Exp. No. N. 2) was as follows:—

Eggs deposited	...	...	31st May to 2nd June.
Larvæ hatched	...	...	10th June.
1st moult	...	...	13th to 14th June.
2nd „	...	...	18th June.
3rd „	...	...	21st June.
4th „	...	...	24th June.
5th „	...	...	28th June.
Larvæ began to spin cocoons			2nd July.

These larvæ were still alive in their cocoons on the 7th October, which is against the occurrence of a second brood, as previously mentioned.

The following facts may be noted in addition to those detailed by Packard. The larvæ begin to use the posterior end of the body for clinging in the second larval stage. When a little more than half grown, that is, after the third moult, the larvæ begin to congregate in masses similar to those formed by the Pine Saw-fly, *L. pini*; this fact is important practically as will be shown in discussing the remedial measures. The mature larvæ congregate to a certain extent but not so densely as the younger ones.

Packard states that once shaken off the trees the larvæ cannot ascend the trunk, and he consequently recommends jarring the trees as a good remedy. I have very frequently observed the larvæ ascending the trunks of trees from which they have been either shaken off or washed off by rain; they travel slowly but ultimately regain the twigs.

General description of the Attack and its Effects.—The ages of the larches which are attacked by the saw-fly vary from 5 to about 100 years, that is, practically from the youngest to the oldest. Many of the young plantations consisting of larches of six to eight years of age were badly attacked, but the older plantations of trees from twenty to fifty years of age were affected most seriously, and the results of defoliation by the larvæ are more apparent on the older trees than on the trees in the young plantations.

The effect on the trees of the defoliation by the larvæ has been a matter of considerable discussion among owners and others, and there appears to be a tendency to minimise the evil which may result from such repeated annual defoliation. In the United States of America, Packard mentions that in certain regions from 10 to 30 per cent. of the trees were destroyed by the larvæ. There is now, however, evidence in the Lake District of the fatal effect of repeated defoliation. In the

Dodd plantation on the south-east side of Bassenthwaite Lake, which belongs to Miss Spedding, and which I visited in July, about 200 acres are attacked, and the trees were almost entirely defoliated at the time of my visit. The presence of the larvæ, I was informed by Miss Spedding's head woodman, has been visible for about six years, but he had never seen anything similar to it either in the Dodd or in the neighbouring plantations during the sixty years he had lived in the district. The result of this prolonged attack is that many hundreds of the trees have already been killed and many are dying ; of the trees dead and dying 3,000 have been cut down and, I am informed, there are twice as many still to be felled.

It is not difficult for the biologist to understand how the death of these trees has been caused by the ravages of the larvæ. Like most rather closely planted fell-side larches they have merely a crown of green leaves from which to obtain their organic food ; if this small supply is repeatedly cut off, although possibly for only half its annual life, the tree cannot procure even a minimum amount of food. The result, therefore, of the repeated diminution of the annual store of food over a series of years is, as one would expect, fatal. The vitality of the tree is also affected in another manner. As a result of the defoliation, which is often complete by the beginning of August, the trees respond by putting forth a second crop of green leaves, and the defoliated plantations have a green appearance when all the unattacked larches have lost their leaves. This will not only weaken the already diminished vitality by drawing on the small amount of the stored food of the tree, but further injury may result through the destruction by frost of the second crop of leaves.

Distribution of Nematus erichsonii in the Lake District.—A fairly complete inspection of the district was made in August, 1908, with a view to ascertaining the extent and intensity of the attack, but as it was not possible to visit the whole of Cumberland and Westmorland the absence of a plantation from this list does not necessarily indicate the absence of the saw-fly from that district. I believe, however, from visits that I have made to neighbouring localities, that the attack is at present confined to the Lake District. The insect was found in the following localities :—

Windermere District.—North. Between Rydal Water and Grasmere (p.),* W. side of Grasmere (d.p.), Elterwater (p.), Skelwith Bridge (p.), S.W. of Clappersgate (p.), near Lady Park (p.), about Bain Gates Inn (p.), Black Crag plantation (p.), near Borwick Lodge (p.). *East.* Garburn Pass (p.), Troutbeck (p.), Borrans (p.), N. of Staveley (p.), Long Sleddale (p.). *South.* Near Newby Bridge. *West.* Esthwaite Water, E. side (p.), Sawrey (p.), Claife Heights (p.), Grizedale (p.).

Coniston District.—East. Head Brow plantation (p.), Coniston Moor plantation (p.). *North.* Waterhead (p.), High Cross plantation (p.), Hawkshead Hill (p.).

The Langdales.—Chapel Stile (p.), plantations on N. and W. sides of Lingmore Fell, N. of Great Langdale Beck and near Mill Beck (p.), Blea Tarn (p.), N. of Little Langdale Tarn (p.), plantations on High Park Fell and Park Fell (p.).

Eskdale and Wastwater.—Eskdale (p.), near Santon Bridge (p.), near Strands (p.), W. of Wastwater (p.), Wastdale and Mosedale (p.).

Ennerdale District.—W. end of Ennerdale (p.), about Lamplugh (p.).

Lowerswater.—Larches on S. side (d.p.).

Lorton Vale.—Plantations along and on W. side of the vale (p.), W. of Low Lorton (d.p.), Whinrigg plantation (d.p.).

Buttermere.—Plantation, S.W. (v.b.), N.E. plantation (b.), plantation near Gatesgarth (v.b.).

Borrowdale District.—Seathwaite (b.), Thornythwaite (v.b.), Rosthwaite (Johnny Wood, &c.) (d.p.), Watendlath (d.p.).

Derwent Water District.—Lodore (d.p.), Brandelhow Park and Lingholm (d.p.), Keswick (p.), Great Wood (d.p.), Rakefoot Pike (d.p.).

Bassenthwaite Lake.—N. of lake (p.). *West and South West.* Mines (?) plantation (b.), Combe plantation (v.b.), Hospital plantation (v.b.), Braithwaite (d.p.). *South East.* Dodd plantation (v.b.), Millbeck (b.), Latrig (d.p.).

Thirlmere District.—North. Shoulthwaite plantation (v.b.), St. John's Vale (p.). *East and West.* Plantations (b.), chiefly (v.b.).

Ullswater District.—West. Matterdale (p.) and (d.p.), W. side of lake (p.), Glenridding (p.). *South.* Hartsop (p.).

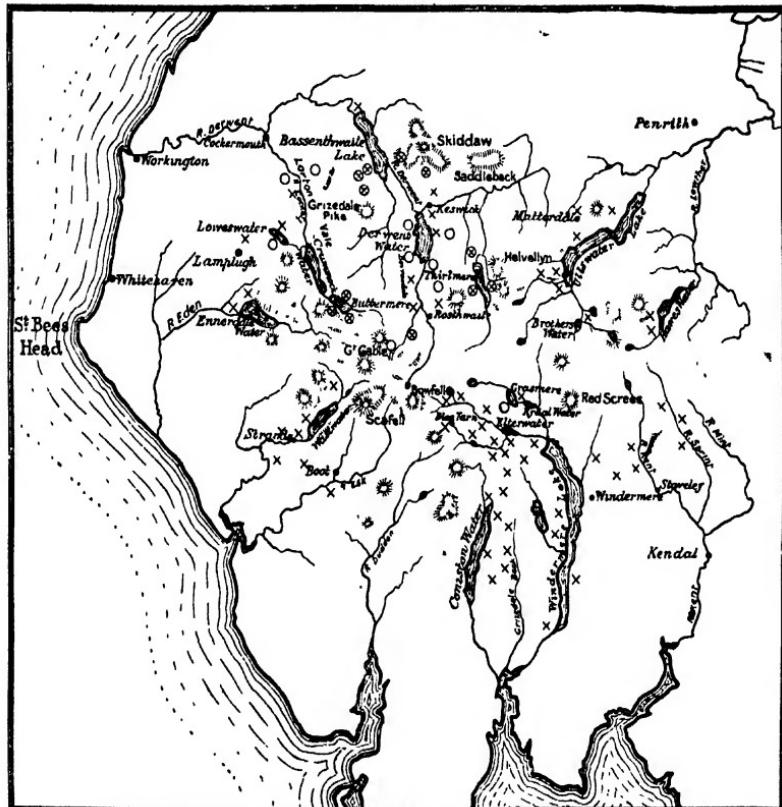
Hawes Water.—Larches at S. end (p.).

The distribution of the saw-fly and the intensity of the attack will be readily understood from the accompanying map.

Means of Detection.—If the larvæ are present in any number there will be sufficient evidence of their presence in the number of defoliated twigs, which give a brownish winter appearance to the branches when seen from a distance. If the larvæ are still young their presence can be detected by the brown and slightly curled appearance of the green leaves near the ends of the twigs, which is due to the young larvæ partially devouring them, usually along one side. In the case of larvæ occurring at the top of tall trees, if their presence cannot be detected by the defoliation of the twigs of the lower branches, it is generally indicated by the small green cylindrical faecal pellets which may be found round the base of the tree; these are figured in

* *Note.*—(p.) indicates that the insect was present, though in such small numbers that its presence would not be noticed by an untrained observer. (d.p.) in these plantations or groups of trees the insect was distinctly present. (b.) indicates that the trees were badly attacked, and (v.b.) indicates that the attack was very bad, the trees being completely defoliated.

MacDougall's paper. A further means of detection has already been mentioned, namely, the dying off and curling round of the short terminal shoots, which is caused by the injury inflicted by the females in depositing their eggs.



THE LAKE DISTRICT

Showing the distribution of The Large Larch Sawfly (*Nematus erichsoni*.)

X Sawfly present O Trees rather badly attacked ◎ Trees very badly attacked

Natural Enemies.—The most important factors in the natural control of the saw-fly which have so far been discovered are birds, and, as will appear strange, the small Field Vole—*Microtus (Arvicola) agrestis*.

When the larvæ were in the earlier stages it was found that the three species of Tits—the Great Tit, Cole Tit, and Blue Tit—fed upon them to a considerable extent. They were also assisted by Chaffinches, which were found feeding on the full-grown larvæ. In addition to these birds, which perform no little service, great destruction of the larvæ was effected by the Rooks, Jackdaws, and Starlings which were to be seen in large flocks in and about the more seriously attacked plantations. They not only fed upon the larvæ on the trees but also followed them on to the ground when about to spin their cocoons beneath the turf. When the larvæ had reached this stage one frequently found that the Rooks had riddled the turf round the bases of the trees with holes in search of the larvæ.

Birds do not normally care for such resinous larvæ as those of *N. erichsoni*, but the present case is an example of a phenomenon which sometimes occurs when an insect assumes unnatural proportions and becomes a pest, and where the presence of a large amount of food temporarily alters the feeding habits of many of the birds of that locality.

During the winter months when the larvæ are enclosed in their tough cocoons they are safe from the attacks of their avian enemies, but it was discovered as a result of observation and experiment that the small Field Vole, *Microtus agrestis*, Flemming (Fig. 1), proves itself of very great service in extracting the larvæ from the cocoons and eating them. This small rodent burrows beneath the turf and litter round the bases of the trees in search of the cocoons; having found a cocoon it nips a small piece off one end and draws out the enclosed larva,* which it then devours. The presence and activity of the voles is attested by the numbers of empty cocoons gathered in small groups in the runs that they have made and the teeth-marks of the voles can be readily distinguished on the empty cocoons (see Fig. 2). During last winter (1907-8) these animals destroyed large numbers of the larvæ in all the plantations on the Thirlmere watershed which were badly attacked. From observations made in different plantations I calculated that they had destroyed about 25 per cent. of the pupating larvæ. Further, dissections of their stomachs and microscopic examina-

* The saw-fly larva remains in the larval stage in the cocoon until about May of the following year, when it changes into the pupa.

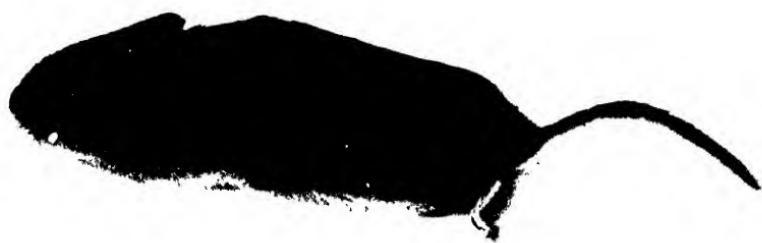


FIG. 1. THE SMALL FIELD VOLE. (*Microtus agrestis*.)

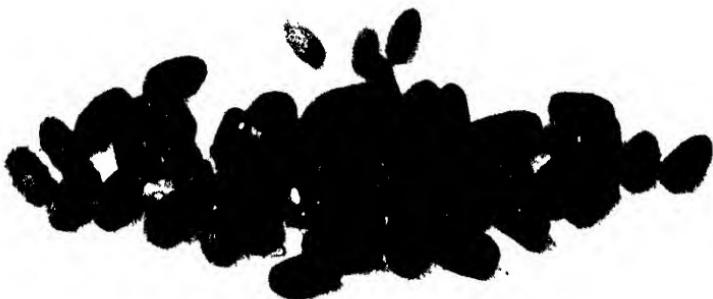


FIG. 2. COCOONS OF LARGE LARCH SAWFLY. (*Nematus erichsonii*.)



FIG. 3. DEAD TERMINAL SHOOTS OF LARCH.

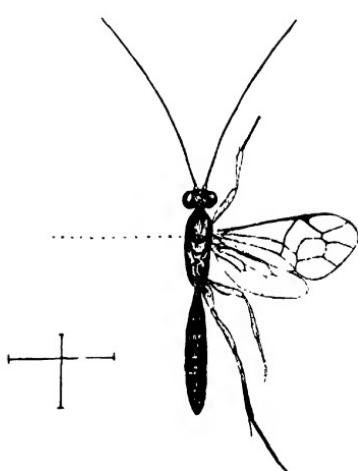


FIG. 4. ICNEUMON (*Mesoleius aulicus* Grav.),
A PARASITE OF THE LARGE LARCH SAWFLY.

tion of the contents showed that they were largely subsisting on the saw-fly larvæ. The normal phytophagous habits of this vole are well known, and this raises a fine question as to the real economic value of the animal in the case of the present attack ; this will be discussed later.

Insect Parasites.—It sometimes happens that an insect pest which has assumed large proportions in a certain region disappears almost as quickly as it appeared. This is often due to the fact that the insect parasites of the injurious insect increase to so great an extent that almost every individual becomes a host and is consequently destroyed. As in the case of lepidopterous larvæ the chief parasites of the saw-fly larvæ are the larval stages of the Ichneumons and certain other minute Hymenoptera. The larvæ of certain Diptera, such as the Tachinidæ, are also parasitic on the saw-fly larvæ. One of the objects of the present investigation was to discover what species of parasitic insects affected *Nematus erichsonii*. So far two parasites have been found, one of which is an Ichneumon, which Mr. Claude Morley very kindly identified for me as *Mesoleius aulicus*, Grav., and the other was a dipterous larva.

Mesoleius aulicus, Grav. (Fig. 4).—It was found that the proportions of cocoons which contained this parasite varied in batches of cocoons from different plantations. From one batch of 136 cocoons 13 Ichneumons emerged, that is, 9·4 per cent. of the larvæ had been parasitised ; a batch of 176 cocoons from another plantation yielded only 6 Ichneumons, that is, only 3·4 per cent. of the saw-fly larvæ contained the parasites. It is of importance to study the numerical proportions of the parasites in the different localities, as it may eventually be found that in certain localities the percentage of cocoons containing parasites is so great that some practical benefit may accrue from the distribution of these highly parasitised cocoons in localities where the percentage of parasites is much lower. This species of Ichneumon appeared to be fairly numerous this year, as I saw several on the wing during my July visit to the affected plantations.

*Description of M. aulicus.**—This insect belongs to the

* For a full description, see E. Holmgren. "Forsok till uppställning och beskrifning af de i Sverige funna Tryphonider." Kongl. vetens-akad. Handl., 1855, p. 134.

group of Ichneumons—the Tryphoninæ. The head is black except in the male, in which the facial region is yellow. The antennæ, which are long and 34-jointed, are black, as also is the rest of the body of the insect. The first and middle pairs of legs are uniformly coloured yellowish brown. The basal joints of the third pair of legs are resinous brown, the tip of the third (femoral) joint being black, the rest of the leg from about the middle of the fourth (tibial) joint is also black. Its length is 9·5 mm. (about $\frac{3}{8}$ in.) and the breadth across the wings is 17 mm. (almost $1\frac{1}{6}$ in.).

Dipterous Larva.—Two specimens of the larva of a species of Dipteron were obtained from the larvæ of *N. erichsoni*. As no mature insects of this parasite were obtained it is extremely difficult on account of our scanty knowledge of the larvæ of Diptera to identify even the genus. I believe, however, that they are Tachinidæ belonging to the sub-family Sarcophaginæ. They appeared to be mature and measured 10 mm. in length.

Remedial and Preventive Methods.—In combating a pest of this nature, where large areas of mature trees, growing chiefly on mountain and fell sides that are difficult of access, are attacked, we are faced with enormous difficulties. In the first place many of the methods usually suggested against such insects, although they may be suitable for isolated trees of an ornamental character or small groups of trees, if they are not quite impracticable on a large scale, entail a greater expense in their execution than the value of the timber will allow.

It was found that the method of burning the litter and turf which surrounds the bases of the trees and contains the cocoons though very efficacious was much too costly, even where the plantation was fairly accessible.

The plan of jarring the trees suggested by Packard is not to be recommended as I have already mentioned, unless the larvæ be caught in outstretched sheets beneath the trees and subsequently burnt.

Where plantations of young trees are attacked it is easier to take active measures. Spraying with arsenite of copper is effectual and has the advantage of being cheap. A pound of arsenite of copper is dissolved in 150 gallons of water; from 4 to 6 quarts of flour are mixed with the solution to make it more adhesive to the foliage, the flour being put into the

solution through a fine wire gauze to divide it finely. But a still more effectual method of destroying the younger larvæ is to crush them with a gloved hand. For this method to be carried out rapidly and to secure the best results, the larvæ must be carefully watched until they reach the stage where they congregate in masses, that is, about the third and fourth larval stages ; in this stage of the life-history I have counted as many as sixty larvæ in a single mass, all of which could be easily destroyed by a single closing of the hand. If they are dealt with in this manner a number of men can quickly clear a plantation of young trees from five to eight years of age. Spraying might be restricted to the slightly older trees whose upper branches are out of reach. Hand-picking also proved very effectual in the case of young trees.

In the older plantations it is necessary to rely on natural means of control, such as have been mentioned already. Some natural means of control, however, can be assisted and augmented, and such is the case with regard to the birds which have been mentioned as feeding on the larvæ ; chief of these are rooks, starlings, jackdaws, and tits. In the districts where the trees are badly attacked these birds should not be destroyed on any account. The starlings and tits should be encouraged and protected by feeding them during the winter and thus preventing the customary great mortality which results from hard weather, and also by the provision of nest-boxes in the plantations. Larch plantations are singularly devoid of suitable nesting places for these birds and they should therefore be supplied. In England these insectivorous birds are not sufficiently encouraged in places where nesting sites are absent by the provision of nesting boxes, the value of which form of forest protection has been recognised for a number of years in Continental forests. The best type of nest-box is that designed by Baron von Berlepsch.*

As the Field Vole, *M. agrestis*, has been shown to be an important means of control by destroying the larvæ in the cocoons, it would be in the interests of the forester not to destroy the vole until the saw-fly attack shall have subsided. If it is found that they are increasing to any alarming extent and attacking

* "How to Attract and Protect Wild Birds," by M. Hiesemann. Translated by Emma S. Buchheim. London : Witherby, 1908.

young trees, it will be necessary to take active measures against them, but unless this occurs, in view of the great assistance derived from their presence in combating the saw-fly, it would be advisable neither to destroy nor encourage them.

In districts where the attack of the saw-fly is pronounced it would be well to postpone the planting of young larch trees, unless some remedial measures such as have been suggested can be carried out. If the land cannot be spared another species of conifer might be planted, as *N. erichsoni* strictly confines its attention to the larch.

If the natural means of control, such as birds, are encouraged, and it is upon these and the parasites that the extermination of the pest chiefly depends, the attack will last for a much shorter length of time, and there will ultimately be a less pecuniary loss than if a policy of *laissez faire* be adopted.

Description of Figures.

Fig. 1.—The Small Field Vole, *Microtus agrestis*, which feeds largely on the larvae of the saw-fly during the winter months. (Three-quarters natural size.)

„ 2.—Cocoons of *Nematus erichsoni*, from which the larvae have been extracted by the Field Vole. The teeth-marks are distinctly visible on many of the cocoons shown. (Natural size.)

„ 3.—Dead terminal shoots of larch, showing characteristic curled appearance, caused by the wounding of the stem by the female saw-flies in depositing their eggs.

„ 4.—*Mesoleius aulicus*, Grav. An Ichneumon parasite of the larch saw-fly. Three times natural size, which is shown by the cross-lines.

I am indebted to Dr. O. V. Darbishire for photographing Figs. 1 and 2.

THE BRITISH CROPS OF 1908.

The preliminary statement of the estimated yield of the cereal, pulse, and hay crops in 1908 was issued on the 6th November and that relating to the potato and root crops on the 23rd November last. The average yield per acre of each of these crops is given in the following table, which also shows the difference from the result recorded last year, and from the average of the ten years 1898–1907.

Crop.	Yield per Acre in 1908.	Difference from—	
		Yield in 1907.	Average Yield of 1898-1907.
Wheat	Bushels. 32·29	Bushels. — 1·67	Bushels. + 0·59
Barley	32·81	— 2·45	— 0·57
Oats	39·80	— 3·24	+ 0·05
Beans	30·16	— 4·34	+ 0·10
Peas	28·21	— 1·23	+ 0·92
Potatoes	Tons. 6·97	Tons. + 1·55	Tons. + 1·19
Turnips and swedes	15·31	+ 1·18	+ 2·15
Mangold	21·01	+ 1·15	+ 1·73
Hay from clover, &c. ...	Cwts. 31·42	Cwts. — 1·55	Cwts. + 1·47
Hay from permanent grass ...	25·11	— 2·12	+ 0·90
Hops	12·10	+ 3·77	+ 3·26

From this it will be seen that, although the high yields of corn and hay last year have not been maintained, the average yield of each crop this year exceeds that of the ten-year period, except in the case of barley, which shows a slight decline.

The total production and yield per acre of the cereal and pulse crops in the past two seasons are shown in the next table.

Crop.	Estimated Total Produce.		Estimated Yield per Acre.		Average of the Ten Years 1898-1907.
	1908.	1907.	1908.	1907.	
Wheat ...	Quarters. 6,565,370	Quarters. 6,900,774	Bushels. 32·29	Bushels. 33·96	Bushels. 31·70
Barley ...	6,839,081	7,546,273	32·81	35·26	33·38
Oats ...	15,467,616	16,799,015	39·80	43·04	39·75
Beans ...	1,105,442	1,328,630	30·16	34·50	30·06
Peas ...	544,533	592,077	28·21	29·44	27·29

The area sown to wheat this year was slightly greater than in 1907, but the total production falls short of last year's by some 340,000 quarters, the decline in the average yield amounting to nearly 1 $\frac{1}{2}$ bushels per acre. In England the yield per acre was more than 1 $\frac{1}{2}$ bushels, and in Wales more than half a bushel, below that of last year, but in Scotland it was nearly 2 $\frac{1}{2}$ bushels in excess. Compared with the ten years' average the yield

this year is better in each division, and the excess in Great Britain as a whole amounts to a little over half a bushel per acre.

The total production of barley is 700,000 quarters less than last year, this being partly due to a reduction in the area under the crop. The yield shows a decline of $2\frac{1}{2}$ bushels per acre from the high figure recorded last year, which, however, had only once previously been exceeded. In England it is nearly $3\frac{1}{4}$ bushels less than in 1907, but in Scotland it is better to the extent of 2 bushels. Wales shows a falling-off of three-quarters of a bushel. Barley is the only crop this year of which the yield falls short of the ten years' average, the deficiency amounting to half a bushel per acre, Scotland alone showing an improvement in this respect.

The results as regards oats are somewhat similar to those recorded for barley. As compared with 1907 there has been a decline of 1,300,000 quarters in total production, which is only partially accounted for by a slight decrease in the area under the crop. The average yield is less than the record figure of last year by $3\frac{1}{4}$ bushels. England and Wales both show a deficiency, which in the case of the former amounts to $5\frac{1}{4}$ bushels, but in Scotland the yield is 2 bushels more per acre than in 1907. The yield in Great Britain this year is only just above the ten years' average, Scotland again being the only part to show an increase.

In common with the other corn crops beans and peas both show a considerable falling-off from last year's figures, but the yield of each crop is above the ten years' average, though in the case of beans only slightly so. In England (which accounts for nearly the whole of the area under these two crops) the yield of beans is $4\frac{1}{2}$ bushels, and of peas $1\frac{1}{4}$ bushels, less than last year.

The estimated total produce and yield per acre of the potato- and root crops are given in the table below :—

Crop.	Estimated Total Produce.		Estimated Yield per Acre.		Average of the Ten Years 1898-1907.
	1908.	1907.	1908.	1907.	
Potatoes ...	Tons. 3,919,798	Tons. 2,977,485	Tons. 6.97	Tons. 5.42	Tons. 5.78
Turnips and swedes ...	Tons. 23,738,207	Tons. 22,085,718	Tons. 15.31	Tons. 14.13	Tons. 13.16
Mangold ...	Tons. 8,987,161	Tons. 8,936,922	Tons. 21.01	Tons. 19.86	Tons. 19.28

The total production of potatoes this year is nearly 1,000,000 tons more than in 1907, and is the largest crop returned since official statistics of production were first collected. The average yield, which is $1\frac{1}{2}$ tons above that of last year, also constitutes a record. The yield in England is practically the same as in Great Britain as a whole, but in Scotland it exceeds $7\frac{1}{2}$ tons per acre. The figures for these two countries are likewise higher than any hitherto returned, but the yield obtained in Wales viz., $5\frac{1}{2}$ tons, has frequently been exceeded. Compared with the ten years' average the yield in Great Britain shows an excess of nearly $1\frac{1}{2}$ tons.

As in the case of potatoes, the average yield of turnips and swedes is higher than that of any previous year, but the total crop, although 1,650,000 tons greater than in 1907, has frequently been exceeded, the area under this crop having declined steadily for many years past. The yield this year is nearly $1\frac{1}{4}$ tons above that of 1907, a result mainly due to an improvement of $4\frac{1}{4}$ tons in Scotland, the yield in England showing a slight falling-off. In Wales, where the area under the crop is, relatively to the whole, small, the yield is $1\frac{1}{4}$ tons better than last year. In each country this year's yield is considerably above that of the average of the previous ten years, and the excess in Great Britain as a whole is more than 2 tons per acre.

The total production of mangolds is only 50,000 tons above that of last year, when there was a larger area under the crop, but it is the largest returned in any year with the exception of 1902. The average yield is more than 1 ton better than in 1907, and has also only once been exceeded, in 1903. The figures for England, where nearly the whole of the mangold crop is grown, are practically the same as for Great Britain. In Scotland, where the area is less than 2,000 acres, the yield exceeds that of 1907 by over $6\frac{1}{2}$ tons. As compared with the ten years' average the yield is this year higher in each country, and amounts on the whole to $1\frac{3}{4}$ tons.

The total production and yield per acre of hay and hops are shown in the next table.

Both classes of hay show a considerable falling-off in total production from last year's figures, the total decrease amounting to over 700,000 tons. The yield of clover and rotation grasses is $1\frac{1}{2}$ cwts. below that of 1907, the decline in England alone being rather less. In Scotland and Wales the deficiency

amounts to 2 cwts. The ten years' average is, however, exceeded by 1½ cwts., the excess in England being over 2 cwts., but in Scotland the yield is under the average to the extent of half a cwt. The yield of meadow hay is 2 cwts. less than last year, but exceeds the ten years' average by nearly 1 cwt. In Scotland the yield of meadow hay is three-quarters of a cwt. more than last year, and is only 1 cwt. less than the yield this year from clover and rotation grasses.

Crop.	Estimated Total Produce.		Estimated Yield per Acre.		Average of the Ten Years 1898-1907.
	1908.	1907.	1908.	1907.	
Hay from clover, &c. ...	Tons. 3,507,468	Tons. 3,709,977	Cwts. 31·42	Cwts. 32·97	Cwts. 29·95
Hay from permanent grass	6,214,431	6,719,257	25·11	27·23	24·21
Hops	Cwts. 470,761	Cwts. 374,129	12·10	8·33	8·84

The yield of hops is 3½ cwts. above that of last year, and 3½ cwts. in excess of the mean, and although there has this year been a considerable decline in the area the total production exceeds last year's by nearly 100,000 cwts.

In a general survey of this year's harvest the most noticeable features are the very heavy crops of potatoes and roots. It may also be noticed that the harvest generally has been more successful in Scotland than in the south, every crop except hay from clover and rotation grasses having there yielded better than last year.

COST OF REARING DUCKLINGS.

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During the spring months of 1904 and 1905 experiments were conducted on the College Poultry Farm, Theale, in connection with University College, Reading, in order to obtain data as to the growth of chickens and the cost of rearing, the results of which were then published.* With a view to

* See *Journal of the Board of Agriculture*, August, 1905.

obtaining similar information with regard to ducklings, an experiment has been carried out during the present year, and a trial of the value of what is known as the Hopper system of feeding for ducklings was carried out at the same time.

Description of Birds.—For the purpose of this experiment forty ducklings, hatched artificially on 28th April, 1908, were selected. These were from eggs laid by the stock of Aylesburys bred upon the College Poultry Farm, Theale. These birds have been carefully selected for purity of race, excellence of laying, meat properties, and vigour of constitution. While not of the huge size found in some Aylesburys they are very good in colour of bill and flesh, and when forced have proved to be rapid in growth. No duckling died during the experiment.

Management.—The ducklings were all hatched artificially in the same incubator, and when twenty-four hours old, the forty birds were placed in heated Hearson brooders with small grass runs, where they were kept for two weeks, at the end of which time (13th May) they were divided into two flocks of twenty, each of which was put in a cold Hearson brooder with 100 square feet of grass run; when four weeks old (27th May) each lot was put into a small house with a large grass run, and one week later (3rd June) they were removed into ordinary duck houses near a stream, where they had large grass runs and free access to water for swimming.

During the whole period after they were two weeks old all the birds in each lot were fed as shown below, and no attempt was made to force growth, either by keeping in small runs, by withholding from swimming water, or by feeding upon fattening foods, as the ducklings were intended to be kept as breeders for autumn killing. The cost of producing early ducklings for killing, which is a special branch of the industry, remains for further experiment.

Cost of Eggs and Hatching.—The eggs were set in March, when their actual cost of production on the College Farm was about 10d. per dozen, but for easier calculation 1s. per dozen is taken as the cost, although these eggs were saleable at a higher price for hatching purposes. Fertility was very good, and the average hatching was 73 per cent. of fertile eggs, but as infertile incubator duck eggs are not of much value the hatching percentage of the total number of eggs put in, namely, 67, is

taken. Thus nearly 60 eggs were required to produce 40 ducklings, and the egg-cost of each one hatched was $1\frac{1}{2}d.$.

The cost for oil burned in a 100-egg incubator* is 3d. per week (using Majestic oil at 8d. per gallon), and allowing five weeks for regulation and complete hatching, this gives a total of 1s. 3d. Although the machine used would hold more than 60 eggs, we may take that as the basis, which works out at $7\frac{1}{2}d.$ per lot of 20 ducklings, or 0·38d. per duckling hatched. For heating two brooders for a fortnight $1\frac{1}{2}$ gallon of oil was used, the total cost of which was, say, $9\frac{1}{2}d.$, or 0·28d. per duckling.

Foods and Feeding.—During the first two weeks all the forty birds were fed on soft food, consisting of the following mixture, which was moistened with hot water until it was in a crumbly state and given warm five times a day :—

A.—Rearing food mixture :

Bran...	...	...	...	...	...	...	40 lb.
Toppings	...	...	...	...	...	...	20 lb.
Barley meal	...	...	...	...	...	...	36 lb.
Linseed meal	...	...	...	...	...	...	2 lb.
Meat (Crissel)	...	...	...	...	...	...	14 lb.
Total	...	...	...	...	...	...	<u>112 lb.</u>

This cost 10s. per cwt., or 1·072d. per lb.

After the first fortnight, Lot I continued to be fed on this soft food, given four times per day, until they were four weeks old, after which the food was supplied three times a day. In each case it was supplied in sufficient quantity to be eaten eagerly and cleared up at once.

At the end of the first two weeks, Lot II were fed on the same mixture given dry, in order to test the value of this method for duck raising. Grit was supplied to both lots all the time, but when given access to the stream the ducklings would obtain as much as they required. No green food was given, but grass was eaten freely as it was plentiful.

After the ducklings were nine weeks old the following mixture was substituted for the rearing mixture :—

B.—Summer food mixture :

Bran ...	...	...	...	...	...	...	40 lb.
Toppings	...	...	...	...	...	...	20 lb.
Barley meal	...	...	...	...	...	...	32 lb.
Clover hay, chaff	...	...	...	...	...	...	20 lb.
Total	...	...	...	...	...	...	<u>112 lb.</u>

This cost 7s. 1½d. per cwt., or 0·76d. per lb.

* See report on "Artificial Incubation," *Journal*, May, 1905, pp. 87-96.

EXPERIMENT NO. I.—SOFT FOOD (20 DUCKLINGS).

The gross consumption and cost of food are shown in Table I to the age of nine weeks, and the average weekly weights and increases in Table II. Particulars of cost to a greater age are given in the general summary.

TABLE I.—Gross Consumption and Cost of Food.

Week Ending—	Food Consumption.		Cost of Food.		Average Weekly Cost per Bird.	Cost per lb. of Increased Weight.
	Weekly.	Total.	Weekly.	Total.		
1908.	lb.	lb.	d.	d.	d.	d.
May 6	5·5	5·5	5·9	5·9	0·3	10·63
„ 13	17·0	22·5	18·22	24·12	0·91	5·83
„ 20	17·5	40·0	18·76	42·88	0·94	3·84
„ 27	19·25	59·25	20·63	63·51	1·03	3·41
June 3	30·5	80·75	32·7	96·21	1·63	34·00
„ 10	33·0	122·75	35·38	131·59	1·77	2·09
„ 17	40·0	162·75	42·88	174·47	2·14	6·12
„ 24	52·0	214·75	55·74	230·21	2·78	4·85
July 1	61·5	276·25	65·93	296·14	3·3	5·17
Grit for period	—	10·0	—	3·75	0·18	—
Totals ...	—	286·5 lb.	—	299·89d.	14·98d.	4·7d.

Total food consumed 2 cwt. 2 qrs. 6 lb. 8 oz.
" cost of food £1 4s. 11·89d.

Weight of food consumed for each lb. gained .. 4·5 lb.

Average cost of food per bird 1s. 2·98d.

Cost of increased weight, per lb. gained 4·7d.

TABLE II.—Average Weekly Weights and Increases.

Week Ending—	Total Weight.	Total Weekly Gain.	Average Weight.	Average Weekly Gain in Weight.	Total Average Gain.
1908.	oz.	oz.	oz.	oz.	oz.
April 29	41·12	—	2·06	—	—
May 6	50·0	8·88	2·50	0·44	0·44
„ 13	100·0	50·0	5·0	2·5	2·94
„ 20	178·0	78·0	8·9	3·9	6·84
„ 27	274·75	96·75	13·74	4·84	11·68
June 3	290·12	15·37	14·5	0·76	12·44
„ 10	560·0	269·88	28·0	13·5	25·94
„ 17	672·0	112·0	33·6	5·6	31·54
„ 24	856·0	184·0	42·8	9·2	40·74
July 1	1060·0	204·0	53·0	10·2	50·94

From Table II it will be seen that the average gain in the first three weeks was 6·84 oz.; in the second three weeks,

19·1 oz.; and in the third three weeks, 25 oz., or a total of 3 lb. 2·94 oz. Table I shows that the average cost per bird in the first three weeks was 2·15d.; in the second three weeks, 4·43d.; and in the final three weeks 8·22d., or a total (inclusive of grit for the entire period) of 14·98d. It will be seen that the least gain made was in the fifth week (May 28th to 3rd June) and the greatest gain in the following week (4th to 10th June). Climatically there was no explanation for this variation, as the weather was pretty much the same. It was, however, on 1st June when the birds were admitted to the running stream, and it may be that the change together with the exercise taken when first given access to the natural element was the reason. Whatever was lost was more than made up during the next week. Table I shows that no difference could then be traced in the food consumed.

The weight of the twenty birds at 24 hours old was 2 lb. 9·12 oz. At the end of nine weeks they weighed 66 lb. 4 oz., so that the total gain was 63 lb. 10·88 oz.

EXPERIMENT II.—DRY MASH (HOPPER FED), 20 DUCKLINGS.

The object of this experiment was to test how far the dry mash system of feeding as applied to chickens* was suitable for the rearing of ducklings. In the case of this lot the birds were fed during the first fortnight on moist food, after which they were given the A mixture in dry condition, but water to drink was available all the time. The gross consumption and cost of food is given in Table III and the average weekly weights and increases in Table IV.

Table IV shows that the average gain during the first three weeks was 5·94 oz.; in the second three weeks, 20·2 oz.; and in the last three weeks, 22 oz., or a total of 3 lb. 14 oz. From Table III will be seen that the average cost per bird in the first three weeks was 1·8d.; in the second three weeks, 2·41d.; and in the final three weeks (inclusive of grit for the entire period), 9·27d., or a total of 15·25d. In this case the gain was least in the fifth week, as in Lot I, and was greatest in the sixth week, when from some reason not explained, those fed on soft food grew much more rapidly, and finished with an average excess of 2·8 oz. over Lot No. II.

* See "Cost of Feeding Chickens," *Journal*, January, 1908, p. 611.

The weight of the twenty birds at 24 hours old was 2 lb. 9·12 oz., at the end of nine weeks they weighed 62 lb. 12 oz., so that the total gain was 60 lb. 2·88 oz.

TABLE III.—Gross Consumption and Cost of Food.

Week Ending—	Food Consumed.		Cost of Food.		Average Weekly Cost per Head.	Cost per lb. of Increased Weight.
	Weekly.	Total.	Weekly.	Total.		
1908.	lb.	lb.	d.	d.	d.	d.
May 6	5·5	5·5	5·9	5·9	0·3	10·63
,, 13	17·0	22·5	18·22	24·12	0·91	5·83
,, 20	11·0	33·5	11·79	35·91	0·59	3·14
,, 27	17·0	50·5	18·22	54·13	0·91	3·3
June 3	25·0	75·5	26·8	80·93	1·34	5·66
,, 10	36·0	111·5	38·59	119·52	1·93	2·57
,, 17	49·0	160·5	52·53	172·05	2·63	4·67
,, 24	54·0	214·5	57·89	229·94	2·9	7·24
July 1	67·0	281·5	71·82	301·76	3·59	8·7
Grit for period	...	8·0	...	3·0	0·15	...
Totals	...	289·5 lb.	...	304·76d.	15·25d.	5·06d.

Total food consumed 2 cwts. 2 qrs. 9 lb. 8 oz.

Total cost of food £1 5s. 4·76d.

Weight of food consumed for each lb. gained... 4·68 lb.

Average cost of food per bird 1s. 3·25d.

Cost of increased weight per lb. gained ... 5·06d.

TABLE IV.—Average Weekly Weights and Increases.

Week Ending—	Total Weight.	Total Weekly Gain.	Average Weight.	Average Weekly Gain in Weight.	Total Average Gain in Weight.
1908.	oz.	oz.	oz.	oz.	oz.
April 29	41·12	—	2·06	—	—
May 6	50·0	8·88	2·50	0·44	0·44
,, 13	100·0	50·0	5·0	2·5	2·94
,, 20	160·0	60·0	8·0	3·0	5·94
,, 27	248·25	88·25	12·4	4·42	10·36
June 3	324·0	75·75	16·2	3·79	14·14
,, 10	564·0	240·0	28·2	12·0	26·14
,, 17	744·0	180·0	37·2	9·0	35·14
,, 24	872·0	128·0	43·6	6·4	41·54
July 1	1004·0	132·0	50·2	6·6	48·14

COMPARISONS AND SUMMARY.

From the above experiments it is evident that the hopper system is equally suitable for rearing ducklings as for rearing chickens. With the latter, whilst the cost was greater, the

weights attained were much heavier and the cost of increased weight per pound gained, which is the true test of any system, was smaller. Ducklings fed on dry mash on the other hand did not grow quite so fast in the last two weeks, and cost rather more per pound gained than those fed on soft food, though the actual amount is small. This is explained more fully in Table VI, which gives the comparisons between the two lots.

The cost of the ducklings at nine weeks old is arrived at as follows :—

TABLE V.—Cost of Ducklings at Nine Weeks Old.

	Lot I.			Lot II.		
	Soft Food.			Dry Mash.		
				d.		
Initial cost of egg	1·5	...	1·5
Cost of working incubator	0·38	...	0·38
", " brooder	0·28	...	0·28
", " food, average	<u>14·98</u>	...	<u>15·25</u>
Average cost per bird	<u>17·14</u>	...	<u>17·41</u>

In these results, which are remarkably uniform, it will be seen that no estimate is made for interest on capital, which would be very small indeed, according to the number of birds hatched and reared, as one incubator and two brooders would be capable of producing and rearing 400 ducklings in a season. As regards labour, in many cases the birds would be reared by the owner and the profit would amply compensate him. Where assistance was hired, then the amount to be debited to that item would depend upon the number reared and what other work was done; 1*d.* per duckling would be an ample allowance for the former, inclusive of depreciation of plant, but the latter may be left out of present consideration.

The total cost, therefore, of rearing a duckling to nine weeks, either on soft food or dry mash, is about 1*s.* 6*d.* Probably that would be increased if the birds were fed for early killing, but, as already mentioned, these experiments were not intended to secure rapid growth, which fact must be kept in view. They confirm the opinion generally held that ducklings are heavy feeders. In the tests with chickens* raised to a killing age—thirteen weeks—the corresponding cost worked out at from

* "Growth of Chickens and Cost of Rearing," *Journal*, August, 1905.

$7\frac{1}{2}d.$ to a fraction over $8\frac{1}{2}d.$, which is less than half that of the ducklings. But for spring killing, the latter are much more valuable.

A comparison of the two lots is given in Table VI :—

TABLE VI.

	Lot I. Soft Food.	Lot II. Dry Mash.
Total food consumed	2 cwt. 2 qrs. 6 lb. 8 oz.	2 cwt. 2 qrs. 9 lb. 8 oz.
,, cost of food ...	$\text{£1 4s. } 11\frac{1}{2}d.$	$\text{£1 5s. } 4\frac{1}{2}d.$
Weight of food consumed for each lb. gained	4·5 lb.	4·68 lb.
Average cost of food per bird ..	1s. 2·98d.	1s. 3·25d.
Cost of increased weight per lb.	4·7d.	5·06d.
Total gain in weight . . .	63 lb. 10·88 oz.	60 lb. 2·88 oz.
Average gain in weight ...	3 lb. 2·94 oz.	3 lb. 0·14 oz.
,, weight, 9 weeks ..	3 lb. 5 oz.	3 lb. 2·2 oz

These experiments enable us to estimate the cost of producing breeding ducks at, say, six months old, for which purpose experiments have been made with older specimens. From nine weeks onwards the birds were fed on the B mixture. During the next five weeks each bird had consumed an average of 14 lb. of food, by which time they had increased in weight to an average of 5 lb., though four specimens weighed 6 lb. each. During the next ten weeks the average consumption of food was $35\frac{1}{2}$ lb., making $49\frac{1}{2}$ lb. in all, the value of which is 3s. 2d. If to this is added the cost of the duckling at nine weeks, the total expense in hatching and rearing a duck to twenty-four weeks is brought up to nearly 5s., which shows that the opinion generally held, namely, that the rearing of ducks for winter marketing is less profitable than the breeding of spring ducklings, is justified.

WART DISEASE (BLACK SCAB) OF POTATOES.*

The disease known as Wart Disease, Cauliflower Disease, Canker, "Fungus" or Black Scab, *Chrysophlyctis endobiotica*, Potter (doubtfully of Schilbersky), attacks the tubers and haulms of potatoes, giving rise to large and irregular out-growths which resemble pieces of cauliflower covered with mud.

Warts or wrinkles appear at first near the eyes of the young

* This memorandum is issued as Leaflet No. 105, and copies can be obtained on application at the offices of the Board.

tuber, and later several warts by growing together form a brown spongy scab, which finally becomes black.

Black scab has no connection with ordinary potato scab and does not resemble it in appearance, but as both are frequently found on the same plant they are sometimes confused.

Although the disease has been known to potato growers in the Liverpool district for some fifteen years it was not reported to the Board until 1901. Since then a number of cases have occurred in Lancashire, Cheshire, Shropshire, Staffordshire, and Warwickshire, while a few outbreaks have been recorded in other English counties, in Wales and in Scotland.

The disease has caused most damage in gardens or allotments where potatoes are grown every year, but in a few cases there has also been serious loss in potatoes grown in a four-course rotation. Land may be unfit for potato-growing for as long as six years after infection.

The occurrence of the wart disease in the affected districts is similar to that of the Finger-and-toe disease (Leaflet No. 77) which, on certain soils and in some seasons, has caused serious damage to turnips. Although in the first instance only a few plants may show the wart disease, it is almost sure to spread more or less rapidly and the disease must be treated as a dangerous enemy, which, if neglected, may entirely prevent the growth of potatoes.

Cause of Infection.—The diseased tubers or haulms contain numberless "spores" (the "seeds" of the disease) which are not only capable of infecting healthy potatoes the following season, but may also lie dormant in the soil for more than four years.

The diseased tuber is the usual source of infection and the spread of the disease from one holding to another is mainly to be attributed to the planting of infected sets.

When disease appears it may, if neglected, spread over a farm and render the soil useless for potato growing in the course of a few years. It is spread by manure, by the decay of affected haulms, tubers, and runners in the soil, and it may even be carried from one field to another on implements and boots.

Infection is very readily conveyed by manure if raw diseased tubers are fed to stock, or if diseased haulms are thrown on the manure heap. Dung which has been contaminated in this way

should not be used for potato growing. If practicable, it should be applied to permanent grass.

Preventive and Remedial Measures.—1. "Seed" potatoes from a diseased crop or from a field in which disease is known to have occurred within six years should be avoided. If "seed" potatoes are purchased in a district in which the disease is common, they should be bought as soon after harvest as possible; the sets should be freely sprinkled with sulphur (4-5 lb. will dress 1 ton) and should then be stored in boxes or pits until required.

Tubers only slightly diseased may easily be overlooked, and may cause widespread infection when planted.

2. In the case of a disease like wart disease, which infects the land gradually, it is necessary to detect and stamp out the fungus as soon after infection as possible. When discovered the entire plant affected should be carefully removed, the useless portions burned, the tubers boiled without delay, and the soil dressed with gas-lime. Further, when the field is next planted with potatoes the piece of ground where the disease appeared should be fallowed and dressed with gas-lime at the rate of 4 to 5 tons per acre.

If the attack has occurred in a garden required for frequent potato growing, the occupier should dig out and burn, not only the affected plant, but a considerable quantity of the surrounding soil so as to ensure that every fragment of the diseased plant is destroyed. Gas-lime should then be applied to the soil.

3. If fields worked on the four-course rotation have become generally infected, farmers should replace the potato by some other crop, so as to let eight years intervene before the next potato crop is planted. The sets should be dusted with sulphur before planting, as recommended above.

4. In gardens and allotments in which the disease has been noticed, potatoes should on no account be planted on the same piece of land next season and one of the three following methods of treatment may be adopted:—

(a) The ground towards the end of April should be covered with gas-lime (2 lb. to the square yard) which may be forked into the surface soil to a depth of 3 in. After lying fallow until the end of June it should be dug and prepared for cabbages.

(b) If the soil is deep, 2 lb. of gas-lime per square yard may be applied at the end of March, and a month later the soil should be inverted by deep trenching. Any crop except potatoes may be grown.

(c) The affected land should be sprinkled with sulphur (4 oz. per square yard) early in May, and, after having been lightly forked in, any crop except potatoes may be sown or planted.

Whichever of these methods may be adopted it is necessary, when potatoes are next planted in the garden, that the sets should be dusted over with sulphur, and 2 to 4 oz. of sulphur per square yard should be applied to the soil as planting progresses. Before the potatoes are earthed up the surface of the soil round the haulms should be sprinkled with sulphur.

It is said that one or two varieties of potato do not suffer from wart disease. The variety known as "Snowdrop" appears to escape infection, and the varieties "Maincrop" and "Conquest" have also been known to escape when other sorts planted in the same garden have been attacked. These varieties are, therefore, worthy of the attention of those whose land has become infected; but the preventive measures indicated above should still be carefully followed.

N.B.—Wart disease (*Chrysophlyctis endobiotica*) is scheduled as a notifiable disease under the Destructive Insects and Pests Acts, 1877-1907, and occupiers of land on which the disease occurs must at once report it to the Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W. In reporting an outbreak, occupiers must state their names in full and their postal address, and it is desirable that specimens for identification should be sent to the Board.

THE APPLE BLOSSOM WEEVIL.

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The Apple Blossom Weevil (*Anthonomus pomorum*, Linn.) has long been recognised by fruit growers as a serious pest wherever it occurs in any numbers. During the past five or six years I have given considerable attention to the life history and bionomics of this insect and many facts of importance to

fruit growers have been discovered, or verified, and not a few published statements proved to be incorrect.

Distribution.—The Apple Blossom Weevil is widely distributed throughout England and Wales, and is fairly plentiful in Ireland, but less so (so far as records show) in Scotland. Outside the British Isles it is found in France, Germany, Austria and Hungary, and it is also recorded from the United States.

It appears and disappears with remarkable suddenness, and this phenomenon was noted very early in the work here recorded particularly in Worcestershire, Hereford and Gloucester. Very frequently it is restricted to a particular part of an orchard, or to one orchard while not appearing in those closely adjoining it. An instance of this was observed in two orchards adjoining one another, where in one there was a splendid crop of apples, whilst in the other scarcely a blossom had escaped this insect.

Effect of the Weather.—The greatest damage is done when the blossoms open slowly. Knight* states that “the depredations of this insect are usually fatal to a larger proportion of the blossom when the time of its expansion has been preceded by hot and dry weather.” Whitehead† records that in the tedious cold spring of 1886 it was noticed that this pest was actively at work in all directions. Early and very late blossoming varieties escape with much less damage than those of the main crop which come into blossom in May.

Life History.—Early in the spring the beetles leave their winter quarters beneath fallen leaves, stones, clods of earth and under dead or broken bark, and make their way to the apple-trees. Considerable difference of opinion prevails as to how the females reach the buds, some writers state that they seldom use their wings, but crawl up the stem and branches of the tree. Mr. F. V. Theobald‡ states “the males I have often taken on the wing, but never a female, although I have visited and collected in orchards teeming with this beetle.” Kollar§ states that they are not “often seen flying from branch to branch,” Curtis|| also makes the statement that “the females

* “A Treatise on the Culture of the Apple and Pear,” 1801.

† “Insects Injurious to Fruit Crops,” 1886, p. 21.

‡ “The Apple Blossom Weevil,” 1897, p. 3.

§ “A Treatise on Insects Injurious to Farmers, Foresters and Gardeners, 1837, p. 247.

|| *Gardeners’ Chronicle*, 1844, p. 556.

will not readily fly"; Henneguy* states that both sexes fly easily, and with equal frequency. Newman† in writing of the life history of this insect states: "With the first sunshiny day in March these weevils leave their winter quarters, crawl up the trunk and along the twigs, perch themselves so as to receive the full benefit of the sun's rays, and plume themselves with their legs and feet all over, trident and all, just in the same manner that a cat washes her face with her paws; they then stretch out one leg at a time, cramped no doubt by the long confinement; they lift up their wing-cases and unfold two large, transparent wings, which, though twice as long as the wing-cases, were neatly folded up and hidden under them, and then, launching themselves into the air, they go roving about the orchards and gardens."

Numerous other writers might be cited for and against the power of the female to fly, and it is evident that the information we possess is very uncertain. The observations made during 1904, when this insect was particularly prevalent in different parts of Worcestershire support the contention that the females fly to the trees. In one orchard, where the weevil had done considerable damage, after the trees had been sprayed with the caustic soda emulsion in March, three trees were heavily grease-banded, whilst those immediately surrounding them had the old grease-bands removed. On examination later it was found that the blossom buds of all the trees were equally badly attacked, indeed, the three trees with the new grease-bands on were a little worse than the remainder. The grease-bands were very carefully and frequently examined, but on no occasion was a single beetle found. The material used was of such a sticky nature that it was perfectly impossible for any insect to cross the band; it may therefore be safely concluded that so far as these three trees were concerned the female beetles did not crawl up the stems and on to the branches, but in all probability flew there.

On reaching the tree, copulation takes place, after which the female beetle commences to deposit her eggs in the unopened blossom buds. They are most active on still warm days, and when such conditions prevail the females may be seen "hasten-

* Bull. du Ministère de l'Agriculture, 1891.

† "The Letters of Rusticus," London, 1849, p. 82.

ing from one branch to another, examining every bud carefully, and often taking a long while before it can find one suitable for its purpose," as described by Schmidberger in Kollar.*

By means of her long snout-like rostrum a hole is made into which an egg is deposited, this is pushed down into the centre of the bud by the rostrum, and the opening closed with a secretion. Schmidberger states that the time occupied in completing this work is about three-quarters of an hour.

This is again and again repeated in separate flower buds, until anything between twenty and fifty eggs have been deposited. Petit† states that the female beetle is provided with a stylet at the extreme end of its body with which it pierces the flower bud. "It is hard to admit," he states, "that the insect should execute a complicated manœuvre obliging it, after having pierced the bud with its snout, to turn round and place the egg in an invisible hole, smaller than the egg." In six or eight days the eggs hatch out into minute, whitish, legless, maggots, with blackish-brown heads, later they become creamy-white, with the skin very wrinkled and hairy.

On hatching from the egg the grub or larva commences to feed upon the internal part of the blossom, including the receptacle. The blossom-bud expands and the petals partially open, then quite suddenly growth ceases, the petals wither, shrivel, and turn a scorched brown colour. The essential organs of the flower having been destroyed no fruit appears.

Throughout the larval period the larvae lie in the bud in a curved position. When full-fed, viz., in from one to three weeks, the time depending very largely upon the weather, the larvae cast their skins and change into pupæ.

The pupa, which is nearly a quarter of an inch long, is a pale yellowish-brown in colour. The pupal stage occupies from a week to ten days, the beetle then boring its way through the bud, lives upon the tree until late in September.

Schmidberger states that the beetles feed upon the leaves, but Dr. Henneguy, as the result of careful observations, states that they do not feed at all.

Preventive and Remedial Measures.—Both the preventive and remedial measures that have been suggested for this pest

* Op. cit., p. 246.

† *Journ. d'Agric. Pratique*, 1892, Tom. I, No. 1.

are inefficient owing to their impractical nature. I have tried most of the summer spraying fluids recommended with little or no benefit. If Dr. Henneguy is correct as to the adult beetles not feeding upon the leaves, then all poisonous spray-fluids are not only useless, but a waste of time and money.

Jarring the trees so as to shake off the dead blossoms before the larval and pupal stages are over, will rid the trees of nearly all the pests. An old rick cloth should first be placed beneath the trees, and after a vigorous jarring the blossoms and beetles should be swept up, collected and burnt. In the Board of Agriculture Leaflet No. 15 it is stated that four men and two boys treated 110 trees in a day. Whitehead* states that from a tree "from which at the first shaking nearly 1,000 weevils had fallen, 385 were shaken off five hours later and 145 the next day. In the orchard of the Ecole pratique d'Agriculture des Trois Croix, near Rennes, with 347 apple trees on 8 acres, the cost of treatment, which occupied three days, was only £1, nearly 450,000 weevils were destroyed, and there was a satisfactory crop of apples." On a large acreage this method of treatment is scarcely practicable. Personally, I have found that persistent and consistent winter spraying, in order to keep the trees free from dead bark, lichens and mosses, and the clearing away of all rubbish, leaves, long grass &c., beneath the trees and burning the same, coupled with clean cultivation, form the most practicable and economical treatment and give the best results. An example of the necessity for clearing away rubbish occurred in an orchard in the Evesham district recently, where in turning over a heap of old prunings and dead wood I found the heap to be alive with the Apple Blossom Weevil.

NOTES ON THE TIME OF BLOSSOMING OF FRUIT TREES.

CECIL H. HOOPER, M.R.A.C.

With the object of obtaining information as to the period in the blossoming of fruit trees at which the fruit is most susceptible to injury by frost, a record was this year kept day by day of the condition of flowering of the different

* "Report on Insects and Fungi Injurious to Crops," 1892, p. 47.

varieties of fruits in the plantations of the Wye Agricultural College, Kent. The spring of 1908, however, happened to be a season in which practically no harm was done to fruit by frost in this district, except to apricot. This was in full flower on 24th April, and the three nights' frost which followed caused all the blossoms to fall. The Japanese plums (*Prunus triflora*) which were in flower during these nights of frost, were also severely thinned.

The record gives little information as to the effect of weather, but is a guide as to which are the early and late blooming varieties, points which are of importance for cross fertilisation purposes and for spraying. It is more convenient to spray trees that are in the same state of forwardness than to spray trees that flower at different times, some of which would be in bud when others were in full bloom. This point is worthy of consideration, and may influence orchard planting in the future.

Gooseberries.—In gooseberries the flowers and leaves open about the same time. Gooseberries began to flower on 15th April; by the 19th about a quarter of the flowers were open; on the following night there was a frost of 10°, with slight snow, and again when nearly in full bloom on the nights of the 24th, 25th, and 26th they were subjected to frosts of 8, 5, and 2 degrees respectively; on the first night there was snow, which apparently protected the blossoms, as they did not shrivel and fall as might have been expected. Birds (probably house sparrows and chaffinches) "snibbed" many blossoms near the farm buildings between the 15th and 25th April. The bushes were in full bloom from the 28th to 1st May and continued in flower till 13th May, the flowers at the tips of the boughs being the last to open; by the 21st the flowers and berries that had been pecked by birds had fallen. The duration of flowering from the opening of the first flowers to the closing of the last was thirty-six days. Picking the green berries commenced on 26th May, about a month after full flower. The crop was good, the picking was done by going over the bushes three times with intervals between. The weight of fruit on one good bush was 21 lb. The first ripe gooseberries were picked on 10th July, the fruit from a good bush of Yellow Roughs weighing 14 lb.

The different varieties of gooseberry in the plantations appear

to flower at nearly the same time—Lancashire Lad, Berry's Early Kent, and Whinham's Industry commencing to flower in the order named.

Red Currants.—Red currants commenced flowering on 23rd April, and the bushes were in full bloom from the 9th to 13th May; by the 27th all flowers had set and berries formed, taking thirty-four days from start to finish. Red currants are somewhat irregular in time of flowering, and in this they are unlike gooseberries, as on the same bush some branches may be in full bloom whilst others are unopened.

The flower buds generally expand and are in flower before the leaves have opened. Raby Castle is the main variety, but Comet is also grown.

Black Currants.—In black currants the leaves are fully expanded before flowering commences. Blossoms began to open on 4th May, the bushes were in full bloom on 13th and 14th May, and by 26th May nearly all the flowers had closed and were turning into berries, thus making twenty-three days from start to finish of flowering, during which time there was no frost. The crop was exceptionally good, as was also the case with red currants and gooseberries. The berries commenced to colour about the 22nd June and picking commenced on 7th July, about eight weeks after flowering commenced. The fruit from a three years planted bush, planted as a yearling cutting, weighed 4 lb. 14 oz.

Strawberries.—Of the fifteen varieties grown in the college gardens, Royal Sovereign and Vicomtesse Héricart de Thury commenced to flower on 19th May, but by the 21st most of the other varieties were in flower, and by the 23rd all were in flower, including Givon's Late Prolific, which was the latest. Picking from young plants began on 11th June and in quantity on 13th June. There was thus a little less than four weeks between flowering and ripening. The strawberry season this year was exceptionally early, which was said to be due to the warm nights and days, accompanied by showers. Laxton's Latest and Givon's Late Prolific are good varieties, true to their name, being in season about 7th July onwards, but it was noticed that many of the latest flowers on Givon's Late Prolific did not set fruit. These being the last in flower missed fertilisation, probably because there were no other strawberries in flower at the time to cross-fertilise them.

Cherries.—Cherries were in flower from about 22nd April to 20th May. The first ripe cherries were picked on 27th June, nine or ten weeks after flowering. The crop was generally good.

Plums.—Flowering in plums occurs before the leaves unfurl, the leaves opening whilst flowering is in progress. The Japanese plums, Burbank and Abundance, were the first to flower, commencing on 15th April; they were in full flower on 24th April, and all petals were withered or fallen by the 19th May, making altogether thirty-five days in bloom. On the nights of 23rd, 24th, and 25th April there was frost, which apparently led to a light crop on these varieties.

The ordinary European plums (*Prunus domestica*) just missed the frost that damaged the Japanese. Monarchs commenced to flower on 27th April and continued in flower till 20th May (twenty-four days). Other varieties flowered as follows :—Black Diamonds (19 days), Jefferson (17 days), on 1st May; River's Early Prolific (12 days), Sultan (16 days) and Czar (17 days), on 4th May; Victoria (15 days), Coe's Golden Drop, Prince Engelbert, Golden Gage and Pond's Seedling on 5th May. All these plums would be in flower at the same time during part of the period, those flowering first and last having less chance of fertilisation, and those with the longest period having probably the best chance. Most of these European varieties were in flower about seventeen days from commencement of flowering to petals being withered or fallen. Rivers' Early Prolific was the shortest length of time in flower, namely eleven days, whilst Monarch was the longest, viz., twenty-four days. It appears probable that plums with a long flowering period are the most regular bearers. I believe this is found to be the case with the Pershore plum in Worcestershire.

The following is a typical history of the flowering of a plum this year :—2nd May, commenced flowering; 7th May, full bloom; 9th May, some petals fallen; 13th May, three-quarters petals fallen; 18th May, almost all petals fallen—making seventeen days from start to finish of blossoming. Coe's Golden Drop has a large flower, and unlike other varieties of plums some of the filaments of the stamens are pink.

The only damson of which I got a full record was Bradley's King of Damsons, which commenced to flower on 2nd May, was

in full flower on 11th May, and its petals were fallen or withered 16th May, making fifteen days. The Cheshire damson was a few days later.

Mr. C. S. Martin, the manager of the Toddington Orchard Company, Winchcombe, Gloucestershire, very kindly sent me an interesting table showing the influence of the time of blossoming on a number of crops of plums.

DATES OF FIRST FLOWERS ON GRAND DUKE PLUMS AT TODDINGTON, GLOUCESTERSHIRE.

Year.	Date.	Plum Crop Result.
1891	...	Heavy crop.
1892	2nd April	Fair.
1893	13th March	Fair.
1894	18th March ; full bloom, 2nd April	Light.
1895	20th April	Heavy.
1896	11th March	Light.
1897	...	Light.
1898	11th March	Heavy crop, but light in other districts.
1899	...	Light.
1900	...	Very heavy.
1901	...	Very heavy.
1902	About 20th March	None on low ground.
1903	17th February	Almost total failure.
1904	9th April (Dukes and Diamonds commenced to flower at same time)	Heavy crop.
1905	14th March	None on low ground.
1906	5th March ; all plums in full flower 11th April	None on low ground.
1907	28th March ; by April 1st Grand Dukes and Diamonds well in bloom	Heavy crop.
1908	16th March ; full bloom, April 15th. Diamonds' first flowers, 1st April ; full bloom, 27th April	Prospects of a good plum crop.

Pears.—From my notes this year it appears that in most varieties the leaf unfurls and the flower bud opens about the same time ; in some kinds, as *Doyenné du Comice*, the leaves are almost all unfurled before the flowers begin to open, whilst in Williams' *Bon Chrétien* the flower opens before the leaf, the leaf only commencing to unfurl when the tree is in full flower. The order and duration of flowering were as follows :—2nd March, *Beurré Clairgeau* (18 days from commencement of flowering to petals fallen) ; 3rd May, *Beurré Diel* (17 days) ; 4th May, *Duchesse d'Angoulême* (17 days), and *Jargonelle* (15 days) ; 5th May, *Marguerite Marrillat* (14 days), and

Doyenné Boussock (17 days); 6th May, Williams' Bon Chrétien (or Bartlett of America) (14 days); Beurré Giffard (14 days), and Clapp's Favourite (15 days); 7th May, Doyenné du Comice (15 days), and Durondeau (17 days); 9th May, Pitmaston Duchess (14 days); 10th May, Marie Louise d'Uccle (11 days); 11th May, Dr. Jules Guyot (10 days). Quince commenced to flower on 21st May. These figures give an average of a little more than thirteen days in flower and four days between the commencement of flowering to being in full flower.

Importance of Cross-Fertilisation in Pears.—Several pear trees in the college plantations were noticeable this year by not fruiting, although they had blossomed well and were not injured by frost. It is not improbable that this was due to want of fertilisation, a subject which deserves study in this country, and would probably prove of commercial as well as botanical interest.

In an article by W. Carruthers on "The Cross-Fertilisation of Pears" in the Royal Agricultural Society's Journal for 1894, reference is made to the case of a large orchard in the United States, composed of 22,000 Bartlett (*i.e.* Williams' Bon Chrétien) pears, which, though 17 years old and well grown, were almost barren, except where through an error in planting there were two Clapp's Favourite and one other tree, in the neighbourhood of which the Bartletts were very productive. Trials at the U.S.A. experiment stations showed the following pears to be nearly or quite sterile without cross-fertilisation:—Williams', Boussock, Claireau, Clapp's Favourite, Gansel's Bergamotte, Louise Bonne of Jersey, Souvenir du Congrès, Superfin, Winter Nelis, and others: whilst a smaller number have been observed to be able more or less to fertilise themselves. These include Angoulême, Diel, Doyenné d'Alençon, Flemish Beauty, Seckle, and White Doyenné.

Apples.—The habit of the apple is for the leaves to unfold before the flowers open. Records were taken of ninety-six varieties out of 135 varieties growing in the college plantations; the blossoms were in general abundant and the weather favourable and without frost.

There seemed to be very little difference in the time of flowering between bush and standard trees of the same variety on cultivated land, nor did the stock appear to influence the date

of flowering, whether they were worked on the crab, free, Non-such, English broad-leaved Paradise, or French narrow-leaved Paradise.

One point of interest noticed in the manure trial plots was the late flowering of Wellington apples in a plot without potash. The eight plots received various combinations of artificial manures, and it was observed that Wellingtons on the plot receiving nitrate of soda and superphosphate without potash were notably later in flower than on any of the other plots, including the unmanured; the fruit was less in size and quantity, and the growth also of the trees is less than on other plots.

There does not appear to be any relation between the time of flowering and that of maturing fruit, although some of the early flowering apples, such as Irish Peach, Mank's Codlin, Duchess of Oldenburgh, and Mr. Gladstone come in season early, whilst Court Pendu Plat or the Wiseapple and most of the cider apples are the latest to flower, Court Pendu Plat being in season from December to May. Two cooking apples, Golden Noble and Wellington, each commenced to flower on 19th May, were in full bloom on the 27th, and their petals had fallen on 3rd July, but their respective seasons were different, that of Golden Noble being from September to December, that of Wellington from November to March.

The earliest flowering apples were in bloom an average of $16\frac{1}{2}$ days, the second early, $15\frac{1}{2}$ days; the mid-season, $14\frac{2}{3}$ days; the late flowering, $13\frac{1}{4}$ days; the latest flowering, 17 days, or an average of 15 days from 83 varieties recorded. The earliest flowering trees took an average of 8 days between commencing to flower and being in full bloom; the second early took 6 days; the mid-season averaged 5 days; the late $5\frac{1}{2}$ days, and the latest also $5\frac{1}{2}$ days. Some varieties, such as Winter Quoining, Hoary Morning, Blenheim Orange, and Loddington, had only a short flowering period of nine to eleven days, whilst of varieties having a long duration of flowering may be mentioned Mank's Codlin, Prince Bismarck, Ribston Pippin, Irish Peach, Cox's Orange Pippin, Bramley's Seedling, Potts's Seedling. Lane's Prince Albert was eighteen or nineteen days in flower, and Graham's Royal Jubilee twenty-one days.

Earliest Flowering Apples.—The earliest varieties in the college plantations in 1908 were:—6th May, Irish Peach (18 days); 9th May, Mank's Codlin (19 days); 10th May, Adam's Pearmain (17 days) and Duchess of Oldenburgh (18 days); 11th May, Prince Bismarck (19 days); 12th May, Pearson's Plate (15 days), Tyler's Kernel (16 days), Gravenstein (16 days), Ribston Pippin (19 days), Charles Ross (19 days), Wagener (10 days), White Transparent (13 days), Mr. Gladstone (16 days), Washington (17 days), and Scarlet Nonpareil (17 days).

Second Early Flowering Apples.—On 13th May, Royal Snow (14 days), Duchess's Favourite (14 days), Byford Wonder (15 days), Warner's King (15 days), Alfriston (15 days), Baumann's Red Winter Reinette (16 days), Boston Russet (17 days), Braddick's Nonpareil (18 days), and Stirling Castle (18 days); 14th May, Shepherd's Fame (10 days), Flower of Kent (11 days), Beauty of Kent (15 days), Calville Malingre (15 days), Christmas Pearmain (16 days), Lord Suffield (17 days), Cox's Orange Pippin (19 days), Saltmarsh's Queen (17 days), and American Mother (21 days); 15th May, King Harry (9 days), Golden Spire (14 days), Hambledon Deux Ans (14 days), Leather-coat (15 days), Beauty of Bath (15 days), Yorkshire Beauty (15 days), Brownlees's Russett (16 days), Worcester Pearmain (16 days), Peasgood's Nonsuch (16 days), Okera (16 days), and New Hawthrden (17 days).

Mid-Season Flowering Apples.—On 16th May, Twenty Ounce commenced to flower and continued in bloom 12 days, Scott's Winter (13 days), Roundway Nonsuch, Roundway Magnum Bonum, D'Arcy Spice (15 days), Fearn's Pippin (16 days), Lady Sudeley (16 days), Bramley's Seedling (18 days), Potts's Seedling (18 days), Royal Late (18 days), and Lane's Prince Albert (18 days); 7th May, Egremont Russet, Allen's Everlasting (12 days), and Summer Pippin (15 days); 18th May, Winter Quoining (9 days), Hoary Morning (10 days), Colonel Vaughan, Mère de Ménage (13 days), Sturmer Pippin (13 days), Norfolk Wonder (13 days), Lady Henniker (14 days), Betty Geeson (14 days), King of the Pippins (15 days), Gascoyne's Scarlet (16 days), Seaton House (16 days), Brabant Bellefleur (16 days), Gloria Mundi (15 days), Belle de Pontoise (16 days), Cat's head (16 days), Allington Pippin (16 days), and Vicar of Beighton.

Late Flowering Apples.—On 19th May, Hambling's Seedling, Lord Derby (13 days), Ecklinville (14 days), Striped Beefing, Calville Rouge (cider), Golden Noble (16 days), Wellington (16 days); 20th May, Foster's Seedling (11 days), Slack my Girdle (cider) (10 days), Dutch Mignonne, London Pippin, Cornish Gilliflower (12 days), and the Sandringham (16 days); 21st May, Blenheim Orange (11 days), Loddington (11 days).

Latest Apples.—23rd May, Graham's Royal Jubilee (21 days), and Jersey Chisel (cider); 26th May, Cherry Pearmain (cider) (16 days), and Foxwhelp (cider); 27th May, Medlar commenced to flower—full bloom 3rd June, petals fallen 15th June (20 days); 28th May, Broad-leaved Norman (cider) (16 days); 30th May, Court Pendu Plat (14 days); 3rd June, Argile Gris (cider).

Mr. F. Ivo Neame, of Faversham, has sent me a record for 1907 and 1908 of the opening, full blossom and fall of petals of some 22 apples and 7 pears taken at his farms at Selling and Chilham, which corresponds fairly closely with my own record at Wye.

Mr. Frederick Chittenden, however, has sent particulars of the record of blossoming, taken at the Royal Horticultural Society's gardens at Wisley, Surrey, in which he points out some instances in which the order of flowering at Wisley differs from mine, showing that observations should be taken in different localities and for several years to get greater exactitude.

Mr. Edward A. Bunyard who kindly sent me notes on the first flowers of some 170 varieties taken this year at Maidstone, remarked:—"It is curious to notice the short duration of blossom this year, from earliest to latest only about fifteen days."

Period of Blossoming in United States.—A bulletin issued this year by the New York Experiment Station on "The Relation of the Weather to the Setting of Fruit," gives the average duration, according to six years' record, in that State, as about 9 days for apples, while five years' records show pears to be 7 days in flower; peaches, 8 days; plums, 7 days; cherries, 7 days, and grapes, 10 days. The number of trees on which the observations were made is given in each case, and varies from three to six. The *each* varieties of apples began to flower on 10th May, the last ~~on~~ 20th May. The shortest length of time for any apple to be in flower is six days, and the longest twelve days. Thus the apple trees in this State appear to take but nine days,

to do what takes the apples here fifteen days to accomplish. No correlation was observed between the times of blooming and fruiting, but much stress is laid on the importance of cross-fertilisation, and the planting together of varieties that bloom simultaneously is recommended.

The order of flowering of different varieties in New York State is in general similar to that in England. The Gravenstein, Duchess of Oldenburgh, Twenty Ounce, Wagener, Washington, Gladstone, Bismarck, and Beauty of Bath are among the early bloomers, whilst the later ones include Ribston, King of the Pippins, Cox's Orange and Lane's Prince Albert.

My thanks are due to the Principal of the South Eastern Agricultural College, Professor M. J. R. Dunstan, M.A., for the use of the College plantations for observation, and to Mr. Seymour Deadman, Instructor in Fruit-growing, for his assistance and information, particularly as to varieties; also to those gentlemen who have kindly allowed me to compare their records of time of blossoming with my own.

Caterpillars forwarded for examination from Worthing were stated to be doing great damage to apple and pear trees,

which were in some cases as bare as in

**Notes on Insect,
Fungus and other
Pests.†** midwinter. One orchard of 50 acres was very badly infested. The cater-

pillars were identified as those of a small Tineid moth, viz., *Carcina quercana*, F.;

they feed in webs on the under surface of the leaves of apple, beech, oak, and other trees. Winter washing (see Leaflet No. 70) should be practised in combating the attacks of *Tortrix* and Tineid apple pests, while early spraying with arsenate of lead (bought in the paste form) should be employed against the feeding caterpillars.

Specimens sent from Aberfeldy proved to be small Ermine moths, which are described in Leaflet No. 65. In the web forwarded about 700 cocoons were counted.

BEETLES.--Six species of beetles were received from Norwich. One proved to be *Anobium domesticum*, a very small, brown

* Notes on insect, fungus and other pests, dealing with the specimens submitted to the Board for identification, and their apparent prevalence, will appear in this *Journal* month by month. The notes commenced with the issue for June, 1908.

beetle, dealt with in this *Journal* for June and September, 1907. The second was *Niptus (Ptinus) hololeucus*, a round insect with golden yellow pubescence (seen when the insect is examined with a lens), and with its head bent below the thorax. This beetle was introduced in merchandise, and is now found in many parts of Britain. It lives chiefly in houses, feeding on dry materials, e.g., provisions, wool, &c. It cannot fly. A third beetle was identified as a Ladybird, a small smooth beetle, black in colour with yellow markings. All species of ladybirds are deserving of protection from the cultivator, owing to their destruction of green flies, which form their chief food. A fourth specimen was identified as *Tachyporus hypnorum*, a small beetle with yellow wing covers. It is found amongst decaying organic matter, and belongs to the family *Staphylinidae*, a family with species which on the whole are deserving of protection by the cultivator. A fifth proved to be a specimen of *Sitones* (probably *ononides*). The specimen received was rather rubbed, and therefore determination of it was not absolutely certain. Species of *Sitones* are dealt with in Leaflet No. 19. The sixth beetle forwarded was *Gonioctera polygoni*, which belongs to the same family as the Mustard beetle, viz., *Chrysomelidae*, a family numbering several species which are troublesome owing to their eating leaves.

CELERY STEM FLY.—The dying off of the outside shoots in some specimens of diseased celery forwarded from Bradford was due to the work of the larva of the Celery Stem Fly, which tunnels into the bases of the leaf-stalks. If the attack is not on too large a scale the plants that are infested should be burned. Pupation of the full-grown maggots takes place in the soil or in the destroyed tissues of the plant; the soil, therefore, on the infested area should be turned well down, so that the insects are deeply buried and cannot make their way to the surface. If the area of attack be an extensive one (and there is one record of over 20 acres being attacked) the same crop should not be taken in the following year.

MITES IN HAY.—Specimens from a clover rick at Halstead were identified as *Tyroglyphus longior*, a mite closely allied to the Cheese mite, *T. siro*, with which it may sometimes be found. *T. longior* is known as the Hay mite, and is sometimes found in great quantities round the ricks, and, later on, among the hay.

Infested material has been fed to young cattle, horses and other stock without any injurious effect, except that the horses were found to cough from the tickling induced in their throats by the mites. The mites should be swept together and destroyed by boiling water or paraffin. Infested rooms should be fumigated with sulphur. If troublesome in a loft, whitewashing or washing out with paraffin emulsion would be useful.

FUNGI.—Specimens of black currant leaves were received from Hailsham and Ipswich, and were found to be affected with *Cronartium ribicola*, Dietr., one of the heteroecismal uredines. The alternating aecidial condition of this fungus develops on living bark of the Weymouth pine (*Pinus Strobus*). As the uredo- and teleuto-spore phases are produced on currant leaves, it is highly probable that this condition of the fungus does not necessarily depend for its continuance on the intervention of the aecidium condition on the Weymouth pine. Under any circumstances infection of currant leaves can only be effected while they are still quite young, and as currant leaves are not injured by fungicides, spraying when the foliage is quite young with half-strength Bordeaux mixture should prevent infection. Diseased leaves should be collected and burned. The aecidium stage appears in the form of irregular, dull, orange, powdery masses bursting through the bark of the Weymouth pine.

Hollyhock Rust.—Hollyhock leaves from Ipswich were affected with the well-known Hollyhock Rust, caused by the fungus *Puccinia malvacearum*, Mont. It is most important to collect and destroy by burning all the diseased leaves, leaf-stalks, &c., so as to reduce as much as possible the chances of infection in the spring. During the growing season the plants should be sprayed with Bordeaux mixture, care being taken to spray the underside of the leaves. It has been ascertained that when the carpels are attacked by the fungus, the seeds produce diseased seedlings.

Diseased Willows.—Willow shoots which were received from Berkhamsted were attacked by *Peniophora ochracea*, Mass. This fungus is only known as a saprophyte, and it doubtless attacked the shoots after they had succumbed to some other influence. The nature of the latter was not apparent from the material and data supplied.

Diseased Plums.—Plum trees at Cambridge were attacked

by *Eutypella prunastri*, Sacc.; the primary cause of death, however, seemed to be deep planting, which prevented the root from performing its function of supplying water. This was suggested by the wood of the stem showing indications of having died from the centre towards the circumference. The *Eutypella* doubtless afterwards attacked the unhealthy stem and hastened the end.

Specimens of leaves of geranium, arum and cineraria received from Dorking were covered with *Botrytis cinerea*, Pers. Better ventilation, more especially early in the day, will check the disease. (See *Journal*, Vol. X, June, 1903, p. 17, and July, 1904, p. 242.)

Pears containing grit were also submitted from Dorking. Individual pear trees of various kinds often produce fruit-containing grit. No method of correcting the defect is known.

A large number of specimens of diseased potatoes were submitted for examination, and besides those affected with Wart Disease many were affected with Potato Disease (Leaflet No. 23), Winter Rot (Leaflet No. 193), or *Oospora scabies* (Leaflet No. 137), while one specimen from Gloucester was attacked by Violet Root Rot (Leaflet No. 171). Others were affected with a scab of uncertain origin, not primarily due to a fungus, but probably to physical injury in the soil, and a specimen from Uxbridge was discoloured and the flesh injured owing to a lack of potash and lime in the soil. The latter trouble appears to be most prevalent where potatoes or root crops are grown frequently or continuously on the same land; the tubers may be irregular in form owing to the same cause. Still other specimens of potatoes were scabbed by eelworms, scabbed and hollowed out by millipedes, and in one case gnawed and tunnelled by wireworms.

The utilisation of the manurial constituents of sewage is a subject which has been frequently discussed, but apart from its limited employment on sewage farms

Manurial Value of Sewage and Sewage Sludge. for the growth of plants there appears to be little probability of the problem being successfully solved. The Royal Commission on Sewage Disposal have

referred to the subject* in connection with the land purification of sewage and they have also devoted a good deal of attention to the question of the possible value of sewage sludge as a manure.

Manurial Constituents in Sewage.—The most important manurial constituent of sewage is the ammonia produced by the fermentation of the urea of the urine, but sewage also contains organic nitrogen compounds in smaller quantity, together with phosphates and salts of potash. In the process of sewage purification by artificial filtration, varying quantities of the nitrogen of the ammonia and other compounds disappear, partly, no doubt, from conversion into gaseous nitrogen, and partly from being assimilated by vegetable growths, worms, flies, &c.; the remainder of the nitrogen is converted (in a well purified effluent) into nitrate. The amount of nitrogen which disappears during the treatment of sewage and sewage liquors upon contact beds and percolating filters seems to be from about 40 to 50 per cent. In the case of the filtration and irrigation of sewage on land, the loss is about 60 per cent., but here much of the nitrogen which has vanished has been used up by growing crops.

It is in the form of nitrate that nitrogen is taken up by most plants. Much has been written about the loss to the country arising from the non-utilisation of the nitrogen of sewage which has been purified by artificial filtration, and the Commissioners observe that it is a loss which is certainly to be deplored. It is, however, frequently forgotten that when water-borne sewage is purified on land, upon which grass or other crops are grown, loss of nitrogen is, to a large extent, unavoidable in the colder seasons of the year, since plants can only assimilate nitrate very slowly in cold weather. As regards the production of nitrate in the soil, it is well known that this is largely influenced by temperature, coming practically to a standstill when the temperature is very low, but it is probable that in this country the temperature would very rarely be sufficiently low for a long period, to arrest nitrification.

There is, unfortunately, no economical method of extracting

* Fifth Report of Royal Commission on Sewage Disposal [Cd. 4278. Price, 2s. 9d.]. Appendix viii to Fifth Report : Manurial value of Sewage Sludge [Cd. 4286. Price, 3d.]

the nitrate from a sewage effluent otherwise than through the agency of plants, and there must of necessity be a considerable loss of valuable nitrogenous manure from water-borne sewage, even in the case of land purification. In the case of artificial filtration, supposing the effluent to be subsequently discharged into a stream, the loss is, of course, much greater, all the manurial constituents of the sewage, apart from those in the sludge, being wasted.

The only available manurial product, therefore, is the sewage sludge, which is produced by settlement after chemical precipitation, settlement without chemicals, or septic tank treatment.

Commercial Manure produced from Sewage Sludge.—The Commissioners report on two processes for converting sludge into a marketable manure, which appear to have had a limited success, but as regards one method they doubt whether the process could be worked as a financial success if it were adopted at a large number of places, as a greatly increased production would be likely to lower the price considerably. As regards the other method, the sale of the product is diminishing, and owing to difficulties in manufacture it is found more convenient to sell the sludge as pressed cake.

Production of Pressed Sewage Sludge.—The plan of pressing sludge is adopted at a large number of places. It has the effect of converting the sludge into a form in which it can either be sold to farmers or can be tipped or buried without serious expense.

The plan is as follows :—The sludge produced by the settlement of the sewage, with or without the addition of chemicals, is first run, or pushed by hand labour, from the settling tanks into a sludge well or tank. In this well it is allowed to settle for some little time, and, after the supernatant liquor has been drawn off, the thick sludge is mixed with from 0·5 to 1 per cent. of lime (or even more) in the form of milk of lime and then forced by means of compressed air into filter presses. In this way, on the average, something like 30 or 35 per cent. of the water in the wet sludge (which may be taken at approximately 90 per cent. on the average) is removed, leaving a moist but solid cake which may contain from 50 to 65 per cent. of water. The liquid pressed from the sludge is run back into the settling tanks for re-treatment. It is strongly alkaline, owing to the lime which has been added to the wet sludge. The pressed

cake is scraped from the press-cloths into trucks and either sold to farmers, buried, or tipped. The cost of the process, excluding interest and sinking fund in respect of the pressing plant, may be put at from 2s. to 5s. per ton of pressed cake produced.

Speaking generally, properly pressed sludge when in the form of a solid cake does not give rise to serious nuisance from smell, and if exposed to the air in dry weather it soon becomes entirely inoffensive. It has, however, a slight smell of fresh sewage, and if kept moist, e.g., if it is exposed to the air during wet weather, it soon becomes putrid and gives rise to offensive odours. For this reason it should, if possible, be stored under cover, until it can be spread over land or dug into trenches or buried.

Disposal of the Pressed Cake.—Pressed sludge can usually be disposed of to neighbouring farmers at about 6d. per ton. This, however, depends to a considerable extent upon the district in which the sewage works are situated. In some cases, e.g., at Bury, Ealing (Northern Works), Wolverhampton, and Richmond, where the works are situated in densely populated districts, or are far removed from a railway, or in the case of a large town where the amount of sludge is greater than the neighbouring farmers require, the pressed cake has to be given away, or a small fee has to be paid for its removal. The form of the pressed cake also affects its saleability ; e.g., at Burnley, where the Corporation break up the pressed cake immediately after pressing, a ready market is now obtained.

The composition of the pressed cake varies according to its origin. It naturally contains a good deal of lime. In two samples which were analysed 1·28 and ·89 per cent. of total nitrogen were found after drying. The calculated value as judged by the manurial constituents alone is stated to be 6s. or 7s. per ton, but the actual market value is insignificant, owing to the relatively high cost of carriage upon a mixture containing of necessity a large proportion of water, grit, and carbonaceous matter.

Manurial Value of Sewage Sludge.—Opinions in regard to the manurial value of sludge were of so conflicting a character that the Commissioners thought it advisable to institute some accurate experiments with various sewage sludges, and with

the co-operation of the Board of Agriculture and Fisheries these experiments were carried out at several collegiate centres as follows :—

Series 1.—Experiments with mangolds and swedes at five collegiate centres, under the supervision of Dr. W. Somerville.

Series 2.—Experiments with grass at eight collegiate centres under the direction of Professor Middleton, and at Woburn by Dr. J. A. Voelcker.

Series 3.—Pot-culture experiments at Woburn by Dr. J. A. Voelcker.

In all three series of experiments the same sewage sludges were used, and in each case the sludge was artificially dried before being sent to the experimental stations.

Full details as to the experiments are given in Appendix VIII to the Fifth Report of the Commissioners, and only the general conclusions will be given here. As regards Series 1, Dr. Somerville states :—

“So far as these experiments go, they show that in the season of 1905 none of the sludges experimented with produced any consistent manurial effect on the growth of turnips, swedes, or mangolds. Although the season was not a good one for the growth of the root crops, it permitted artificial manures to exert considerable influence on the yield of this crop. We would, therefore, appear to be justified in drawing the conclusion that the nitrogen and phosphoric acid of sludge are in a much less available form than the same substances in sulphate of ammonia, superphosphate, and fish meal.”

As regards the second series of experiments, which were similar to Series 1, except that hay was the crop to be grown, the broad results showed that at the northern stations, where the wet summer was favourable to slow-acting manures, the application of sludge seems to have been useful. In the South of England, where the hay is cut much earlier, the sludges produced no results whatever, and, speaking generally, the two sludges containing the most lime gave the best results among the sludge grown crops.

In a general survey of these experiments and the experiments of Series 1, Mr. Middleton says :—

“The figures obtained in this experiment and in the corresponding experiments made last year are not of a satisfactory character, and do not permit of any conclusions as to the relative money values of sludge and artificial manures.

“The only definite conclusion which may be stated is that, for root crops and grass, the action of the nitrogenous and phosphatic constituents of

sludge is very slow as compared with the effect produced by nitrogen and phosphates supplied in ordinary artificial manures.

"For such crops as mangolds, potatoes, and swedes, which have a short period of growth, and require quick-acting manures, sewage sludges would not appear to be well adapted, and if they are employed, they should be applied in tons rather than in hundredweights per acre.

"On the other hand, although these experiments do not supply the evidence, it seems likely that sludge, used in proper quantities, would form a good dressing for the slow-growing plants of many permanent pastures and meadows.

"Sludge is unlikely to give satisfaction on the very poor clay-soil pastures which are so much benefited by basic slag, but for old grass land of moderate quality it should prove useful."

As regards the experiments with sewage sludge on grass land at Woburn, carried out by Dr. J. A. Voelcker, which were on similar lines to the above, Dr. Voelcker observes :—

"There is, I think, little more to be said than that, for all practical purposes, the sludges did not 'tell' during this season, but that they require longer time to show their influence, and that the only clear benefit was to be traced to the more quickly acting (because more soluble) material, sulphate of ammonia. That even this increase will, in the end, be a beneficial one is by no means certain, for the mere 'flushing' of a grass field to give an extra cut for hay by no means results necessarily in the improvement of the pasture permanently. Here, again, continuation of the experiment for other years is called for."

In addition to the foregoing experiments with grass, Dr. Voelcker also carried out experiments with wheat at the Woburn Pot Culture Station. These are being continued for another year, but Dr. Voelcker draws the following general conclusion from the first year's work, so far as the wheat crop is concerned :—

- (1) That the different sewage sludges, when used in quantity to supply 40 lb. of nitrogen per acre, are capable of increasing the yield of both corn and straw by 10 to 12 per cent. above the unmanured produce.
- (2) That "artificial equivalents" of the different sewage sludges applied as above, will give rather better results, the increase in corn and straw being 16 to 17 per cent. over the unmanured produce.
- (3) That the tendency of the use of sewage sludges is to produce a greater length of straw.
- (4) That, as between different sewage sludges, those have done best which contain the most moisture and the most lime.
- (5) That the value of sewage sludge does not turn mainly upon the amount of nitrogenous organic matters contained, but that these may, indeed, be in a form incapable of ready assimilation and requiring lime for their decomposition.
- (6) That, from a practical point of view, none of the sewage sludges used would be worth 10s. a ton on the farm, for wheat-growing purposes.

In conclusion the Commissioners observe that unit for unit the nitrogen and the phosphoric acid of sludge seem to be of less value manurially than the nitrogen and phosphoric acid of artificial manures ; at any rate so far as the first year of application is concerned. It also appears that sewage sludge is not a suitable dressing for quickly growing plants, unless it is applied in very large quantities per acre.

The important practical consideration, however, is not whether the manurial constituents of artificial manures are, unit for unit, more valuable than the manurial constituents of sewage sludge, but whether a given increase of crop can be produced more cheaply with sewage sludge than with artificial manures. Sewage sludge has undoubtedly a manurial value, but the manurial constituents being of necessity mixed with such a large proportion of grit, the question of its economic use as a manure depends to a large extent upon the cost of carriage.

The annual report* (Part II) of the Intelligence Division of the Board of Agriculture and Fisheries deals with the work

**Report of the Intelligence Division for
1907.**

carried out under the Destructive Insects and Pests Acts, as well as with the miscellaneous duties performed under the general powers of the Board of Agriculture Act.

The action taken in regard to American Gooseberry Mildew during 1907, both before and after the passing of the Destructive Insects and Pests Act, is described, as well as the preliminary steps as regards Warty Disease of potatoes. Reference is made to the very large number of insects and of fungus diseases of plants which were submitted to the Board for identification during the year. In every case where the pest could be determined advice was given for combating it, and the information thus communicated has subsequently appeared in this *Journal*.

The report goes on to deal with other subjects, which came under the notice of the Board during the year, such as the food of birds, meteorology and its bearing on the crops, weeds, milk tests, and the occurrence of an unknown bee disease in the Isle of Wight. The information collected on these different points was communicated to the public as it became available through the medium of this *Journal*.

The number of leaflets despatched from the Board's offices

* Annual Report of the Intelligence Division, Part II. [Cd. 4401. Price 2½d.]

rose from 916,450 in 1906 to 1,355,790 in 1907, and 15,673 individual applications were received as compared with 13,535 in the previous year. Twenty-two new leaflets were issued. The sale of the bound set of the first 100 leaflets continued steadily all through the year and 2,733 were sold, as compared with 3,062 in 1907. The sectional volumes continued also to be in demand and 20,732 were sold as compared with 28,721 in 1906. The falling off in both cases was due not so much to the slackening demand for the books, as to the fact that towards the end of the year the bound set of leaflets 1-100 and some of the sectional volumes were sold out.

On 16th November the Board of Agriculture and Fisheries received a cable message from the British Consul at Philadelphia reporting that an outbreak of Foot-and-Mouth Disease had occurred near Danville, Pennsylvania, U.S.A. The Board at once notified their Port Inspectors and warned them to take special care in

Foot-and-Mouth Disease in the United States. the veterinary examination of animals imported from the United States of America and Canada. It was not till the 18th November that the existence of the disease was officially confirmed, when the Board at once made and issued Orders scheduling the State of Pennsylvania under the Foreign Animals Order of 1903 and the Foreign Hay and Straw Order of 1908. Special arrangements were at the same time made for dealing with cargoes of animals that had left Pennsylvania previous to the Orders operating. Subsequent information received by the Board caused them to make Orders affecting the States of New Jersey, New York, Maryland, and Delaware, similar to those issued in the case of Pennsylvania. On 28th November the Board made an Order requiring the veterinary examination, on board the vessel prior to landing at the Foreign Animals Wharf, of cargoes of animals carried to this country from the United States of America.

The effect of the Board's Orders is to prohibit the landing of animals brought from the scheduled States; and also the landing of hay and straw from those States, except such as comes under the provisions of Article 2 of the Foreign Hay and Straw Order. The ports at which animals are usually shipped to which the above Orders apply are Philadelphia, New York, and Baltimore.

The Canadian Government have forbidden any vessel carrying live-stock from a port in the United States to touch at a Canadian port, and have prohibited the entrance into Canada of any stock, for any purpose, that has been within the limits of any Prohibited State within the previous two months, either in transit or otherwise, and they have also prohibited the shipment to Europe of any Canadian animals through any American port, or the shipment of Canadian animals from a Canadian port in vessels carrying American stock.

The United States Government have absolutely prohibited the movement of stock from the States quarantined by their Orders, and have also prohibited the inter-state or foreign transportation of hides, skins and hoofs of cattle, sheep and other ruminants, and hay, straw and fodder from the quarantined area.

A monograph on "The Food of some British Birds," by Mr. Robert Newstead, M.Sc., A.L.S., &c., is

**Supplement to the
Journal.**

issued with the present number. This Supplement is supplied free to subscribers to the *Journal*, but it may be

obtained separately, price 4d., post free.-

The weather during the whole of November was with very few exceptions quite unusual. During the *first* week, although bright sunshine was "scanty" in most parts of Great Britain it was "abundant" in the South of England (S.W. "very abundant" S.E. and N.W. "abundant"). Rainfall was "light" or "very light" everywhere. During the *second* week the weather was at first dry and frosty, later mild and changeable.

**Notes on the Weather
in November.**

Sunshine was "abundant" in Scotland and "very abundant" throughout England. Rainfall about the average. During the *third* week the temperature was above the mean, but the sunshine and rainfall about the average. The weather of the *fourth* week was variable. The temperature was "unusual" or "very unusual" everywhere. Rainfall was light except in Scotland. Sunshine was "abundant" in Scotland, E., and England, S.E. The records show that for ten of the thirteen weeks of autumn the temperature in the N.E. of England was above the average, and in only one week was it below. In Scotland, W., and Ireland, N., it was over the average for ten weeks, and below for two. In the Midlands it was above for eight weeks and below for two. In England, E. and N.W., it was above for seven weeks and below for two. It will be seen, therefore, that the season was exceptionally warm everywhere.

Correspondents from Berkshire comment on the mildness of the weather and the absence of fogs and frost (except on three days). The weather has been favourable to farming; grass and keep were plentiful and good progress was made with all kinds of work. One correspondent adds, "Some of the evenings towards the concluding parts of the month have felt as warm as summer evenings. Everyone remarked upon the beautiful greenness of the grass at the close of the month."

The Board of Agriculture and Fisheries issued, on the 23rd of November, 1908, the following preliminary statement showing the estimated total produce and yield per acre of the potato and root crops in Great Britain in the year 1908, with comparisons for 1907, and the average yield per acre of the ten years 1898-1907.

**Produce of the Potato
and Root Crops.**

Crops.	Estimated Total Produce.		Acreage.		Average Estimated Yield Per Acre.		Average of the Ten Years, 1898-1907.
	1908.	1907.	1908.	1907.	1908.	1907.	
	Tons.	Tons.	Acres.	Acres.	Tons.	Tons.	
Potatoes—							
England ...	2,719,539	2,997,814	391,083	381,891	6.95	5.49	5.75
Wales ...	151,700	115,203	27,330	28,141	5.55	4.09	4.99
Scotland ...	1,048,559	764,468	143,692	138,888	7.30	5.50	6.03
Great Britain	3,919,798	2,977,485	562,105	548,920	6.97	5.42	5.78
Turnips and Swedes—							
England ...	14,485,867	14,665,737	1,052,488	1,058,292	13.76	13.86	12.25
Wales ...	933,309	881,936	57,416	58,496	16.26	15.08	14.73
Scotland ...	8,319,031	6,538,045	440,993	446,202	18.86	14.65	15.22
Great Britain	23,738,207	22,085,718	1,550,897	1,562,990	15.31	14.13	13.16
Mangolds—							
England ...	8,748,524	8,690,789	415,360	436,103	21.06	19.92	19.35
Wales ...	196,117	203,864	10,432	11,056	18.80	18.44	17.16
Scotland ...	42,520	42,269	1,980	2,792	21.47	15.14	17.33
Great Britain	8,987,161	8,936,922	427,772	450,041	21.01	19.86	19.28

Germany.—According to the report of the Imperial Statistical Bureau on the condition of the crops in the middle of November, the weather had been unfavourable

during the previous month, and the winter sowings were

in a much less satisfactory condition than in October.

**Notes on Crop
Prospects Abroad.** The arithmetical average puts the condition of winter wheat at 3.3 and of winter rye at 3.2 (2 = good, 3 = medium or average, 4 = small). These figures are

less satisfactory than the similar ones for any of the previous fifteen years. It is feared that a good deal of the sowings, especially wheat, will have to be ploughed up.

The *Landwirtschaftsrat* reported on 1st December that the damage to potatoes by frost amounted to 6.6 per cent. over the whole Empire. Up to 15th November agricultural conditions were rarely worse—many localities had had no rain for eight weeks and sowing was impossible. The unplanted area of wheat is 5.8 per cent. for the Empire, but in several individual States the falling off is considerable.

Russia.—According to *Dornbusch's Evening List* (27th November), the preliminary estimate of the Central Statistical Committee for the 73 Governments gives the yield of winter wheat as 18,430,000 qrs., as compared with last year's final estimate of 20,200,000 qrs. Winter rye is given as 89,425,000 qrs., compared with 91,600,000 qrs. last year.

Mr. P. Stevens, H.M. Consul at Batoum, has furnished a long report on the condition of the crops in the Northern and Trans-Caucasus, from which it appears

that harvesting in the Northern Caucasus took place in fine weather, and threshing operations were carried out under favourable circumstances. The colour and natural weight of the crops were good, but the yield was below the average. Azima wheat did better in the Kuban district than elsewhere, and gave an average of 32 bushels (of 50 lb.) per acre. In the Government of Stavropol and the Province of Ter the results of the winter wheat crops were very bad, only averaging about 470 lb. to the acre, quality and colour being good. Only an insignificant quantity is likely to be exported, as the mills in the interior are buying heavily and paying more than is obtainable in the European markets. As regards hard wheat, the average result is good, with an expected yield of 1,330 lb. per acre. In Trans-Caucasus damage was done in some districts by floods. Wheat and barley in the Province of Kars and adjacent districts have yielded fairly satisfactory results.

The new maize crop in Northern Caucasus is promising, and the yield is likely to be above the average. It is expected that shipments of this year's crop will be made as early as December, instead of in March as usual. In the Western Governments of Trans-Caucasia the maize crop has not been very encouraging; the yield is above the average in the plains, but very much below the average in the mountain districts.

Mr. H. P. Smith, H.M. Consul at Kieff, writing on 21st November, states that, according to the figures available, the shortage of grain in 1908 in European Russia is 1,193,548 tons less than in 1907 and 3,451,613 tons under the average for the five years 1902-6. The shortage in the grain crop of Russia in 1908 has seriously affected the most assured grain district of the country—the south-western—comprising the Governments of Kieff, Podolia and Volhynia, where the decrease equals 1,681,241 tons, or 48·7 per cent. of the total shortage already mentioned, when compared with the average yield for the five years 1902-6.

The general trade of Southern Russia is in a very depressed condition owing to the poor harvests of 1907 and 1908, for agriculture is still the fundamental interest of the district. While there is no fear of the peasantry suffering from famine, or even of the necessity to take extraordinary relief measures, it may be taken for granted that both wheat and rye will have to be supplied to them as seed for the coming season. In fact, rye is being brought in to supply the shortage of crops. There will be neither wheat nor rye available for export from this district, and grave doubts are entertained as to there being a supply of wheat equal to the milling requirements.

Finland.—According to a note on the official returns, furnished by Mr. C. J. Cooke, H.M. Consul at Helsingfors, the rye crop was good, barley and oats gave average crops, while wheat, which is but little grown, gave a fairly good crop.

Roumania.—According to official statistics published by the Roumanian Ministry of Agriculture (16th November), the estimated yield of crops in Roumania during 1908 is as follows:—

	1908.	1907.	1906.
	Bushels.	Bushels.	Bushels.
Wheat	53,100,000	40,900,000
Rye	2,600,000	2,500,000
Barley	12,500,000	19,400,000
Oats	16,700,000	17,300,000
			25,400,000

The quality of the wheat is said to be generally satisfactory, and the weight per bushel is given as 62·7 lb. per bushel, which is just about the average of the past five years.

Hungary.—The official report on the crops in the middle of November was decidedly unfavourable. All agricultural work was backward, and the area of the winter sowings was likely to be smaller, especially in the higher districts.

Canada.—The Report of the Canadian Census and Statistics Office for November states that an attempt was made to ascertain the extent of the increase or decrease in the area sown this year for next year's crop of autumn wheat, last year's crop being represented by 100. According to the replies received it would appear

that the area sown with wheat this autumn is less than that of last year by 4 per cent. In the same way it is estimated that the acreage of summer fallowed land this year is 3 per cent. less than in 1907.

United States.—The Bureau of Statistics in their report for November state that the preliminary returns for the production of maize in 1908 indicate a total yield of about 2,642,687,000 bushels, or an average of 26·2 bushels per acre, as compared with an average of 25·9 bushels as finally estimated in 1907, 30·2 bushels in 1906 and a ten-years average of 25·6 bushels. The general average as to quality is 86·9 per cent. compared with 82·8 last year, 89·9 in 1906, and 90·6 in 1905. It is estimated that about 2·7 per cent. or 96,000,000 bushels of the maize crop of 1907 was still in farmers' hands in November, 1908, compared with 4·5 per cent. in the previous year.

The preliminary estimate of the average yield of potatoes is 85·9 bushels, against an average yield of 95·14 bushels in 1907 and 102·2 bushels in 1906. The indicated total yield is given as 274,660,000 bushels, against 297,942,000 bushels in 1907.

The December report gives the newly-seeded area of winter wheat as 29,884,000 acres, as compared with 31,069,000 acres in 1907. The condition was 85·3, compared with 91·1 last year.

Argentina.—Mr. H. M. Mallet, H.M. Consul at Rosario, writing on October 29th, states that the locust plague commenced very early in the season, the invasion in some parts largely exceeding those of recent years, and at the moment the maize crop is seriously menaced. The wheat and linseed crops are too far advanced to suffer damage to any extent from these pests. Mr. Townley, writing from Buenos Ayres on the same date, gives the official crop figures quoted in last month's *Journal*, and adds that the increase in land under cultivation this year, as compared with 1907, is about 5 per cent. for wheat, 10 per cent. for linseed and 122 per cent. for oats. Vast additional areas in the Pampa are being prepared for wheat cultivation next year. The official figures of immigration give hopes that there will be no shortage of hands for the coming harvest.

The World's Maize Crop.—An estimate of the World's maize crop in 1908, given in *Beerbohm's Corn Trade List* (13th November, 1908), amounts to 408,800,000 qrs., as against 389,050,000 qrs. in 1907, 444,550,000 qrs. in 1906 and 400,000,000 qrs. in 1905.

Hop Crop of Germany.—The German Imperial Statistical Bureau has issued an estimate of the hop crop in Germany in 1908, which puts the total yield at 488,000 cwt., or an average yield of 5·8 cwt. per acre. The yield is calculated on 83,395 acres, which is 5,229 acres less than the total area, as the yield is not separately estimated in parishes having less than 12½ acres under hops. Assuming the same average yield from this additional area, the total yield in Germany is estimated to amount to 518,400 cwt., as against 475,400 cwt. in 1907, 414,000 cwt. in 1906, and 575,800 cwt. in 1905.

The World's Hop Crop.—The hop reporter of the Bohemian *Landeskulturrat* in the middle of October estimated the world's hop crop at 1,750,000 cwt., which is almost exactly the same figure as the estimate for the previous year. The quality is in general regarded as good. The stocks from the previous crop in Bohemia are stated to be completely exhausted, and to be very small in other countries, with the exception of America. The stocks in breweries are also quite unimportant, and it is expected that there will be a good demand, the total requirements being estimated as likely to be larger than this year's crop. (*Reichsanzeiger*, 13th October, 1908.)

According to the Returns furnished to the Board of Trade (*Labour Gazette*, November, 1908) the earnings of farm labourers from the corn harvest in 1908 showed

Earnings at Corn Harvest in 1908. little variation from a year ago in the eastern counties; in the midland and southern and south-western counties, however, the earnings in 1908 were somewhat less than in 1907. The harvest, which was considerably prolonged by rain, was generally of greater total duration than that of 1907, but the

number of days on which harvesting was done was rather less in most districts, the crops on the whole being lighter than in the previous year. The extensive use of machinery lessened the demand for extra labour, and in many districts there were men who were unable to obtain employment.

The following Table shows the average cash earnings, exclusive of the value of any food and drink which may have been provided in addition, of men employed on certain farms in the eastern, midland, and southern and south-western counties of England respectively for the corn harvest of 1908 :—

District.	Number of Men employed at Harvest on Farms included in Table.	Average Duration of Harvest from Start to Finish (including Sundays).	Average Number of Days on which Harvesting was done.	Average Cash Earnings for Harvest per Man.
Eastern counties ...	589	Days. 35	Days. 27	£ ^{s.} _{d.} 7 13 5
Midland counties ...	341	41	24	5 13 10
Southern and south-western counties	607	Days. 28½	20	4 15 2

It will be seen that the earnings were highest in the eastern counties, which comprise the great corn-growing counties of Huntingdon, Cambridge, Lincoln, Norfolk, Suffolk and Essex. The payments in these counties ranged from about £6 10s. to £8, though more was earned by some men on piecework in the Fen districts. In parts of Norfolk and in Suffolk and Essex, the usual system of payment is for the labourer to contract with the farmer to perform the harvest work for a fixed sum, irrespective of the number of days occupied. A short harvest is thus a profitable one for the labourer, as he gets back to ordinary farm work at weekly wages sooner than in a year when the harvest is lengthened by unfavourable weather.

In the midland and in the southern and south-western counties the systems of payment are frequently on a time-work basis, so that harvest earnings fluctuate from year to year according to the duration of the harvest.

The various methods of payment are as follows (apart from that already described for certain eastern counties) : To give the work in separate portions as piecework ; to give the ordinary weekly wages, and in addition, a bonus of pound or two at the end of the harvest ; to give extra time wages for a month certain, and then to pay the ordinary weekly wages ; to pay double the ordinary weekly wages during harvest ; to pay a certain rate per day as long as harvest lasts. Occasionally the ordinary weekly wage is paid and overtime money given.

The northern counties have been excluded from the above Table, as the majority of the farm servants in the north are hired by the year or half-year, and paid a regular wage with free board and lodging during the whole period for which they are hired, and are given no extra money for harvest, though they are often given extra food and drink. Except in Northumberland and Durham, where the system of engagement closely resembles that in the Border counties of Scotland, the married men attached to the staff of a farm generally get from about £4 to £6 for a month at harvest, some food and drink being frequently given in addition. Extra hands, both English and Irish, in these districts sometimes get rather higher payments than the regular men, and often more food. The Irishmen are usually provided with lodging in barns or outhouses on the farms.

The Board of Agriculture and Fisheries have been furnished by the Board of Trade with the following report, based on **Agricultural Labour** about 210 returns from correspondents in **in England** various districts on the demand for **during November.** agricultural labour in November :—

Employment was generally regular throughout November. The supply of extra labour, however, was more than sufficient for the demand in a number of districts, and a number of men lost time in consequence, particularly towards the end of the month, when farm work became well forward.

Northern Counties.—Employment was generally regular in *Northumberland*, *Durham*, *Cumberland*, *Westmorland* and *Lancashire*. It was stated that men were in excess of the demand at the Martinmas Hirings in *Cumberland*, *Westmorland* and *North Lancashire*, and reductions in wages were reported. There was a fairly good demand for extra labour in *Yorkshire* for threshing, work on the potato and root crops, and in sheep folds and stockyards. There was some surplus of men at the hirings in this county, and while previous rates of wages were generally maintained, wages for inferior labour showed a downward tendency.

Midland Counties.—A little interruption to employment from bad weather was reported in *Cheshire*. There was a plentiful supply of extra labour in this county, but some scarcity of men for permanent situations was reported in the *Bucklow Union*. Threshing and taking up potatoes and root crops provided a fair amount of employment in *Derbyshire* and *Nottinghamshire*, but the supply of day labourers was somewhat in excess of the demand. Employment was generally regular in *Leicestershire*, with a fair supply of extra labour. There was, however, some scarcity of men for permanent situations. Continued fine weather permitted constant employment for day labourers in *Staffordshire*, but the supply was ample, one correspondent stating that he had not seen so many men seeking work for a considerable time. In *Shropshire* threshing and root storing caused a good demand for extra labour. There was a moderate demand for day labourers in *Worcestershire* and *Warwickshire*, but the supply was generally about sufficient. Some scarcity of men for permanent situations was reported in *Worcestershire*. A good demand for extra labour was reported from *Northamptonshire*, on account of threshing and root lifting. Men for milking and for tending stock were in request. There was generally regularity of employment in *Oxfordshire* and *Buckinghamshire*, but a few day labourers were in irregular work. Threshing, root lifting and manure carting rendered employment fairly good in *Hertfordshire* and *Bedfordshire*.

Eastern Counties.—There was generally a fair demand for day labourers in *Huntingdonshire* and *Cambridgeshire*, and the supply was in most districts quite sufficient. Little or no irregularity of employment was reported from *Lincolnshire*; in certain districts, however, on account of the forward condition of threshing, there was some decline in the demand for extra labour. Threshing, and work on the root crops generally, provided regular employment in *Norfolk*: the supply of day labourers was ample as a rule, but some scarcity was reported from the *Loddon* and *Clavering Union*. In *Suffolk* and *Essex*, the forward state of out door work somewhat affected the demand for day labourers, and there was a consequent surplus in several districts.

Southern and South Western Counties.—Employment was fairly regular in *Kent*, but the demand for day labourers fell off towards the end of the month, and some men of this class were in irregular work. Storing mangels, spreading manure, trimming hedges, &c., caused a fair demand for day labourers in *Surrey* and *Sussex*, but the supply was somewhat in excess of the demand. Some day labourers were in irregular employment in *Hampshire* on account of an insufficient demand. In *Berkshire* employment was generally regular, with the supply of and demand for labour about equal. There was a fairly good demand for extra men in *Wiltshire*, but in

several districts it was more than met by the supply. Employment was generally regular for all classes of labour in *Dorset*. Raising roots, threshing, and trimming hedges provided a fair amount of employment in *Somerset*. Employment was generally regular in *Herefordshire* and *Gloucestershire*, and the supply of labour about equal to the demand; some shortage, however, of men for permanent situations was reported in certain districts.

Employment was fairly plentiful and regular in *Devon* and *Cornwall*, but day labourers were somewhat affected towards the end of the month, as work on the potato and mangel crops come to an end. A scarcity of men for permanent situations was reported from several districts.

Hedgehogs.—The hedgehog is in general regarded as an insectivorous mammal, although besides beetles and their larvae, snails, worms, &c., it takes snakes, mice, lizards, voles and frogs. Its liking for insects is well

**Miscellaneous
Notes.**

known, and it is frequently kept in houses for the purpose of clearing off cockroaches or "black beetles."

Hedgehogs occasionally take the eggs of both game and poultry, and have been known to eat young chickens. Hens in coops are, it is stated, sometimes liable to be worried by them.

The statement that the hedgehog takes the milk of cows that are lying down is unfounded in fact. It is an old fallacy which was exposed in "The New Catalogue of Vulgar Errors," published 120 years ago by Stephen Lovargue, M.A.

Gilbert White wrote that at Selborne, hedgehogs were good at destroying plantains, but this has been contradicted by "Rusticus," who stated, on the authority of Harting, that the destruction of plantains was the work of a night-feeding caterpillar, which ate the root but left the leaves.

Wart Disease or Black Scab of Potatoes in Germany.—The Plant Cultivation Institute of the Bonn-Poppelsdorf Agricultural College has drawn attention (Deutsche Land. Presse, 30th September, 1908) to the occurrence of Warty Disease in potatoes, a disease which had previously very rarely been observed in Germany. It is reported that whole fields of potatoes in the neighbourhood of Cronenberg, near Düsseldorf, are attacked to such an extent that the crop has been completely destroyed. The grounds chiefly attacked are those belonging to small cultivators, on which potatoes are repeatedly cultivated and to which ashes, dust and night soil are applied as manure. Early potatoes are said to be especially liable. Further information is supplied by Herr Josting, Director of the Winter School at Vohwinkel, from which it appears that the disease also exists at Hahnerberg, Elberfeld, but only on soils where potatoes have been regularly grown, year in and year out. The disease appears to have existed at one place for about five years and gradually to have spread. It has not appeared on farms and gardens where there is a rotation of crops.

Basic Slag.—The Irish Department of Agriculture has issued a Circular to farmers as to the purchase of basic slag in which it is observed that there is nothing in the appearance of basic slag which will give the slightest indication of its value. That depends on three things and *three only*. These are (1) the total percentage of phosphate of lime; (2) the percentage of that phosphate of lime which is soluble in a 2 per cent. solution of citric acid; and (3) the fineness of grinding. When asking for quotations, farmers should see that they are supplied with figures referring to each of these points, and when giving their orders they should insist on getting an invoice on which these figures are clearly stated as a guarantee. No slag should be used in which less than 80 per cent. of the phosphates are soluble, or which shows less than 80 per cent. of fineness. Farmers are warned not to be misled by plausible statements as to other constituents in slag, and not to accept low-grade slag or slags of low solubility, which, although they may be offered at a lower price, are, nevertheless, considerably dearer than high-grade slags and slags of high solubility.

SUMMARY OF AGRICULTURAL EXPERIMENTS.*

EXPERIMENTS WITH LEGUMINOUS CROPS.

Manuring and Inoculation of the Bean Crop (West of Scotland Agric. Coll., Bull. 42).—Experiments were carried out at the College Station and on nine farms in the south and south-west of Scotland in 1905 and at the Station and five farms in 1906; in the first year the experiment was chiefly intended to determine the value of inoculation as a means of supplying the bean crop with nitrogen. In 1906 it was decided to extend the experiment so as to cover more completely the whole subject of the manuring of beans, but the inoculation trials were not repeated. The inoculating material employed was obtained from the United States Department of Agriculture. On five of the farms the inoculation proved beneficial, and an average increase of 304 lb. of grain and $3\frac{1}{2}$ cwt. of straw was obtained. On the remainder, however, it proved less effective; on two farms the returns from treated and untreated seed were approximately the same, on two others there was a moderate reduction in yield of grain, the straw being equal, while at the College Station itself the effects of the inoculation seemed distinctly injurious. This is attributed to the fact that the soil was already rich in organisms such as the culture supplied to the seed, so that inoculation was quite unnecessary, while the treatment may have injuriously affected the germination. Professor Wright, however, in his report on the experiment observes that "apart from that failure, and making due allowance for the discrepancies inseparable from field experiments, the results on the whole tend to show that, under suitable conditions and on ordinary bean soils, the practice of inoculation appears likely to be beneficial and profitable."

Besides the inoculation experiments, trials with various manures were carried out in both years, but it is considered that any final conclusions to be drawn from the results must be deferred until the trials have been continued over a number of years. So far as they have gone, however, they suggest that the bean crop is in a great degree independent of special manuring and is capable of producing fair crops without any manures being applied to it at all. It does, indeed, respond in some measure to the application of manures, but it seems very doubtful, on the average of years, whether the amount of increase obtained will leave a satisfactory margin of profit.

Beans, Change of Seed (Beds. C.C. Rept. on Demonstration Plots, 1907).—This experiment was intended to test the effect of seed obtained from counties other than Bedfordshire. The best results were obtained from Red Spring beans, seed from Essex and Suffolk taking the second and third places.

Manuring of Picking Peas (Essex Educ. Com. Field Expts., 1906).—The object of this experiment was to ascertain if equally good results could be obtained from a dressing of artificials as from a dressing of London dung, which entails heavy cartage expenditure. Very similar results were obtained from each of the following dressings:—(1) 15 tons London dung; (2) 10 tons London dung; and (3) 5 cwt. superphosphate, 5 cwt. kainit, and 1 cwt. nitrate of soda. The application of 5 cwt. basic slag and 5 cwt. kainit gave a much diminished yield, and it is considered probable that this was largely due to the substitution of basic slag for superphosphate, with the consequent difference in the supply of readily available phosphate.

* See Experiments with Cereals, September, 1908, p. 458; Experiments with Root Crops, October, 1908, p. 536; Experiments with Potatoes, November, 1908, p. 621.

EXPERIMENTS WITH VARIOUS FODDER CROPS.

Kohl Rabi (Univ. Coll., Reading, Expts. at College Farm, 1907).—Kohl Rabi was drilled on one plot on May 10th, and yielded 20,904 roots, or 19 tons 4½ cwts. per acre. Another plot was planted on June 25th, with thinnings from the first plot, and yielded 12,536 roots, or 16 tons 5½ cwts. per acre. Both plots received 10 tons of dung and 3 cwts. of superphosphate per acre.

Manuring of Kohl Rabi (Cumb. Univ. Dept. of Agric. Guide to Expts., 1907).—This was an experiment to test the value of calcium cyanamide compared with other nitrogenous manures, and the figures indicate that calcium cyanamide is a useful manure for Kohl Rabi.

Manuring of Lucerne (Camb. Univ. Agric. Dept. Guide to Expts., 1907).—Experiments have been carried out at the East Suffolk County Council Experimental Stations at Bramford and Saxmundham; at Bramford they were made in the six years 1895–1900, and at Saxmundham they were begun in 1903 and are being continued. They show that the Lucerne crop is peculiarly dependent for success upon abundant supplies of both phosphates and potash in the soil, and that if either of these be deficient (as was potash at Bramford and phosphates at Saxmundham), a satisfactory crop cannot be expected until manures are applied. Further, these experiments show very distinctly that the right manure for one soil may be the wrong manure for another, and, in growing Lucerne, farmers ought to ascertain by trial what manure the crop needs. The following simple trial is suggested:—Mark off four plots of one-twentieth of an acre. To plot 1 apply nothing; to plot 2 apply 20 lbs. of superphosphate and 10 lbs. of muriate of potash; to plot 3, 20 lbs. of superphosphate only; to plot 4, 10 lbs. of muriate of potash only. The crop will soon show whether one or both of these manures should be employed in growing Lucerne. It may be noted that at Bramford the best relative result (61 cwts. of hay per acre) on the average of six years (12 cuttings), has been obtained on the plot receiving 1 cwt. muriate of potash, though the plot receiving 2 cwts. nitrate of soda, 2 cwts. superphosphate, and 1 cwt. muriate of potash has yielded 62 cwts. At Saxmundham, on the average of four years (8 cuttings), the best result (67 cwts.) was got from a plot receiving 2 cwts. superphosphate and 1 cwt. muriate of potash, while the plot receiving 2 cwts. nitrate of soda in addition has yielded only 60 cwts.

Manuring of Lucerne (Journal of Roy. Agric. Soc. of England, Vol. 68, 1907).—These experiments have now been conducted at Woburn for six years, and various manures were applied in 1902, 1903, 1904, and 1906, nothing being given in 1905 and 1907. The heaviest yield (green fodder) from three cuttings (19 tons 16 cwts.) was obtained from the plot receiving 4 cwts. superphosphate, 4 cwts. bone dust, 4 cwts. sulphate of potash, and 2 cwts. nitrate of soda per acre. The second best plot (17 tons 9 cwts.) received similar manures except that 2 cwts. sulphate of ammonia was substituted for the nitrate of soda. The unmanured plot produced 11 tons 6 cwts., while applications of phosphates, potash, or nitrogen alone either gave no increase or seemed actually to result in a diminished yield.

Varieties of Lucerne (Journal of Roy. Agric. Soc. of England, Vol. 68, 1907).—Seed from America, Provence, and Canada was sown in 1905. The Canadian variety gave considerably the highest yield both in 1906 and 1907. The Provence seed was slightly better than the American in 1907, this being the reverse of the position in 1906.

Manuring of Maize (Essex Education Com. Field Expts., 1906).—This experiment was instituted in view of the importance of this forage crop as a source of green feed during the late summer months when fodder is scarce, and was carried out on five farms. The dry period which was experienced just when the plants needed moisture resulted in such poor growths on the light soils at two centres that no estimate of the yields was made. On the heavier soils of the three remaining centres, the rainfall was insufficient to allow the manures to produce their full effect, and in consequence little or no reliance can be placed upon the results. It is considered, however, that the following conclusions can be drawn with safety:—(1) That a supplementary dressing of 1 cwt. nitrate of soda to 12 tons of dung will increase the crop; (2) that superphosphate and potash will not materially increase the yield; (3) that in a dry season leaving out farmyard manure and increasing the nitrate will not give such good results as a dressing of dung and an artificial supplement.

ROTATION EXPERIMENTS.

Rotation Experiments (Jnl. Roy. Agric. Soc., Vol. 68, 1907).—The new scheme of these experiments came into operation in 1904 on the upper half of Stackyard Field and in 1907 on the lower half. On the upper half the object sought to be obtained is to ascertain the difference in manurial value obtained by the consumption of, in the one case, decorticated cotton cake, and in the other, maize meal, by sheep feeding off roots on the land; on the lower half the object is to ascertain the difference in manurial value between these two foods when they are fed to bullocks in feeding-boxes and subsequently carted out to the field as farmyard manure and used for growing a root crop. The former plan illustrates the circumstances of a light land farmer who feeds his roots off on the land with cake or corn, the latter illustrates the case of a farmer who feeds cake or corn to his bullocks in the yards and carts out the dung on to his land. It is hoped in this way to attack the problem of the unexhausted manurial value of purchased foods according as they are fed on the land by sheep or given to stock at the homestead. The crops grown in 1907 are reported on in the above publication.

Rotation Experiments (Camb. Univ. Dept. of Agric., Guide to Experiments, 1907).—The results of a number of rotation experiments are given: (1) At Burgoynes Farm an experiment, to show what manures are required and when they should be applied, was carried out on 6 half-acre plots and in duplicate, from 1903 to 1906. The rotation was mangolds, oats, seeds and wheat. The complete results and the estimated profit from manuring are given. (2) Two rotation experiments deal with the effects produced on crops by oilcakes when fed to fattening cattle. So far no marked results can be traced to the cake residues. (3) Two instructive experiments are in progress on Fen soil in West Norfolk. The scheme of manuring is very simple; all the manures are applied to the first crop (potatoes), and the interest centres chiefly in the action of the manure residues. (4) Three experiments in Cambridgeshire and West Suffolk, which have been brought to a conclusion, are summarized and the profit or loss from manuring is given. The rotation was swedes, barley, hay, and oats or wheat.

Experiments are also in progress at the East Suffolk County Council Experimental Stations at Bramford and Saxmundham. At Bramford the crops are arranged in a four-course rotation and treated with various artificial manures. The average results are given for five years. At Saxmundham in

the same way there are four series of plots under experiment on a four-course rotation, each of which bears a different crop in any one year. These plots are sub-divided and treated on 10 different systems of manuring. Each of the large plots may be regarded, therefore, as a farm on which ten different systems of manuring are being tested, or the same section on each of the four plots may be taken together to represent a farm on one definite system of manuring. The results are given for 1906 and to some extent for previous years. The most successful results in 1906 were obtained from the four plots representing a complete rotation, which received the following manurial treatment : 10 tons farmyard manure to wheat, 1 cwt. nitrate of soda and 5 cwts. superphosphate to roots, 2½ cwts. superphosphate to barley, and 2½ cwts. superphosphate to clover ; these plots yielded an average profit of 37s. per acre. Another set which yielded much the same result (36s. per acre) received 10 tons farmyard manure to roots, 1 cwt. nitrate of soda to wheat, and 5 cwts. superphosphate to clover.

MISCELLANEOUS MANURIAL EXPERIMENTS.

Sewage Sludge (Royal Commission on Sewage Disposal, Appendix VIII. to Fifth Report).—The experiments carried out under the supervision of the Board of Agriculture, on behalf of the Royal Commission on Sewage Disposal are described on p. 690 of the present issue.

Sewage Sludge (Univ. Coll. of North Wales, Bangor, Agric. Dept., Bull. VIII., 1907).—This experiment was one of the series mentioned above. The sludges applied failed to produce any appreciable effect.

Green Manuring (Journal Roy. Agric. Soc., Vol. 68, 1907).—Experiments in green manuring have been carried on for a number of years at Woburn, and tares ploughed in have always given a subsequent corn crop inferior to that obtained when mustard has been ploughed in. This result is entirely opposed to theoretical considerations, as tares are a leguminous crop and add twice as much nitrogen to the soil as does mustard. The very interesting question was thus raised as to what was the cause of the apparent disappearance, or at least the non-working, of the nitrogen. Investigations at the Woburn Pot-culture Station have now shown it to be due to the alteration produced in the physical condition of the soil. When tares are grown the soil is left in a light and very open condition, and there is a much more rapid loss of moisture than when mustard is grown. The soil being left in a less consolidated condition and requiring more moisture to be supplied to it, is, in the case of light sandy land, such as that of Woburn, in a much less suitable condition for the subsequent growth of a wheat crop than it is after green manuring with mustard.

Pot Culture Experiments (Journal Roy. Agric. Soc., Vol. 68, 1907).—A short summary of the experiments in 1906-7 is given. The relations of lime and magnesia in soils have been studied, and most interesting results have been obtained, both as regards the quality of the corn (both wheat and barley) and the nature of the root growth. It is found generally that as the relative proportions of lime and magnesia in a soil approach nearer and nearer to the ratio 1 : 1 so the wheat grain tends to become more and more glutinous or "hard," in other words to show more "strength." Inquiries have also been pursued with regard to the "acid" condition obtained in Stackyard Field as the result of the continued application of salts of ammonia to a soil naturally poor in lime. The influence of salts of lithium is being investigated. Chloride and sulphide of manganese have been shown to have a beneficial effect on the oat crop, when given in quantities not exceeding 1 cwt. per acre.

OFFICIAL CIRCULARS AND NOTICES.

The Board of Agriculture and Fisheries have issued the following Circular, dated 20th November, 1908, to Local Authorities as to the repayment of expenses under the Small Holdings Acts :—

Repayment of Expenses under the Small Holdings Acts.

SIR,

I am directed by the Board of Agriculture and Fisheries to enclose herewith for the information of your Council a copy of a Treasury Minute authorising the Board to repay one-half of the expenses incurred by County Councils and the Councils of County Boroughs in ascertaining the demand for small holdings.

The Board would be obliged if you would forward to them a statement of the expenses incurred by your Council up to the 31st March last so soon as the accounts have been audited by the District or Borough Auditor. Full information should be supplied as to the various items of expense in accordance with paragraphs 2, 3 and 4 of the Treasury Minute.

I am, &c.,

T. H. ELLIOTT,

Secretary.

TREASURY MINUTE DATED THE 19TH OCTOBER, 1908.

The Chancellor of the Exchequer states to the Board that he has received representations on behalf of County Councils asking for the repayment from public funds of expenses incurred by County Councils and the Councils of County Boroughs in ascertaining the demand for small holdings.

The Chancellor of the Exchequer refers to the Minute of the Board dated 31st December, 1907, relative to the payment out of the Small Holdings Account of one-half of any loss which may result from the carrying out by a local authority of schemes under the Small Holdings and Allotments Act, 1907, and recommends that, subject to the limits and conditions stated below, one-half of the actual out-of-pocket expenses shown to have been incurred by Councils between the date of the passing of that Act, viz. 28th August, 1907, and the 31st March, 1910, in ascertaining the demand for small holdings, should be recouped to the Councils out of moneys provided by Parliament.

1. Any Council desiring to make a claim for such recoupment should make application to the Board of Agriculture and Fisheries. The first claim should be in respect of the expenditure, if any, incurred between the 28th August, 1907, and the 31st March, 1908, and the next in respect of expenditure incurred in the year ending 31st March, 1909.

2. Such claims should set out full details of the expenses in respect of which recoupment is claimed; and it must be shown to the satisfaction of the Board of Agriculture and Fisheries that such expenses are entirely exclusive of :—

- (a) all expenses incurred in relation to the acquisition of land, the whole of which are already repayable by the Board of Agriculture and Fisheries under Section 17 of the Act;
- (b) all expenses of managing the small holdings when established, which are required by Section 18 of the Small Holdings Act, 1892, to be taken into account in fixing the rents; and
- (c) all expenses included in the calculation of any loss in respect of which a grant has been or might be applied for under the terms of the Minute of this Board dated 31st December, 1907.

3. The claim must be confined to expenses allowed by the District Auditor or Borough Auditor and must not be made until the Accounts have been audited and the items in question have been passed by him. It must further exclude any out-of-pocket expenses of members of local authorities.

4. The expenses in respect of which a claim is made must be strictly out-of-pocket expenses paid by the County Council or Council of the County Borough. Expenses for the services of staff employed may include any additional remuneration paid expressly in respect of work done in ascertaining the demand for small holdings but must not include any other part of the salary or remuneration of persons employed on the general administrative work of the Council or on work other than that arising under the Small Holdings and Allotments Act, who may incidentally discharge duties connected with the latter work. The cost of the services of officers specially appointed to deal with the work under the Act can be taken into account but only to the extent of the proportion of the salaries of such officers as may be shown to the satisfaction of the Board of Agriculture and Fisheries to be fairly attributable to their work in ascertaining the demand for small holdings. Travelling or other out-of-pocket expenses of all officers of the Council when engaged in such inquiries may be included in the claim.

My Lords approve.

The Board of Agriculture and Fisheries have issued the following Circular, dated 9th November, 1908, to Local Authorities in Great Britain as to the establishment of an Investigation Laboratory for Diseases of Animals:—

**Investigation
Laboratory for
Diseases of Animals.**

Sir,

With reference to the Board's Circular Letters A. 47/C of the 2nd February, 1895, and A. 57/C of the 16th September, 1895, I am directed by the Board of Agriculture and Fisheries to inform you that an Investigation Laboratory has been equipped which will enable their Veterinary Officers to carry out, as from the 10th instant, investigations in connection with the scheduled diseases of animals, and other diseases of stock which are of general interest to agriculture.

I am accordingly to suggest that your Local Authority should issue such instructions as will ensure the prompt dispatch to the Board's Laboratory of any specimens about which your Veterinary Inspectors may desire to consult the Board's Veterinary Officers, and any available specimens which the Veterinary Officers may wish to see in connection with any inquiry into an outbreak of disease, such as the heads of animals suspected of being affected with rabies, tissues or prepared specimens by examination of which anthrax, sheep scab, or any of the scheduled diseases have been or may be diagnosed.

In the case of tissues, they should be forwarded in a box, and be securely packed inside some impervious material to prevent leakage. The box should be dispatched at the earliest possible moment, addressed* to—

The Chief Veterinary Officer,
Laboratory of The Board of Agriculture and Fisheries,
Alperton Lodge,
Wembley, S.O.,
Middlesex.

* Parcels forwarded by rail should be sent Carriage Paid, and arrangements made for them to be sent to one of the following stations for delivery:—Sudbury and Wembley Station (London and North Western Railway), Acton (Great Western Railway), Wembley Hill (Great Central Railway).

It is essential, for purposes of identification, that the address label on the box should state the name and address of the sender and the place whence it was sent.

When the box is dispatched, a report should at the same time be forwarded to the Board giving full particulars of the case.

I am, &c.,

T. H. ELLIOTT,

Secretary.

The Board of Agriculture and Fisheries have issued the following Circular Letter, dated 26th October, 1908, to Local

Mixtures of Butter and Milk or Cream. Authorities in Great Britain, as to names for mixtures of butter and milk or cream:—

SIR,

I am directed by the Board of Agriculture and Fisheries to advert to their Circular Letter of the 17th March, 1908, and to inform you that, of the names for mixtures of butter and milk or cream mentioned in that letter, the following have been cancelled:—
Ivelcat, Ivelene, Ivelike, and Ivelmene.

Since the date of that letter the following names have been approved under Section 9 (1) of the Butter and Margarine Act, 1907, for mixtures of butter and milk or cream:—Alimo, Camlaw, Dalphine, Debco, Esselbee, Froco, Maldar, Me-no, Nolax, Samaline, Seeandwi, Ve-vo, and Vivum.

The complete list of names approved for mixtures of butter and milk or cream therefore stands as follows:—Alimo, Bradlae, Brenco, Camlaw, Casa, Casana, Casmon, Casoa, Casora, Casova, Consumo, Dalphine, Debco, Esselbee, Froco, Fromaid, Iveldale, Iveldene, Ivellette, Ivelmore, Jensa, Kingstyle, Maldar, Me-no, Nolax, Peaks' Breadmate, Pearks' Bredspred, Pearksown, Samaline, Seeandwi, Ve-vo, and Vivum.

I am, &c.,

T. H. ELLIOTT,

Secretary.

For the purpose of preventing danger to the public health from the importation, preparation, storage, and distribution of articles of food or drink (other than drugs or water), the Public Health (Regulations as to Food) Act,

Regulations relating to Imported Foods. 1907, applies the methods of control which, under the Public Health Acts, have long been in successful operation with respect to infectious disease, and confers on the Local Government Board a general power of making regulations

with this object. The Local Government Board have accordingly made two sets of Regulations, dated 12th September, 1908, viz., "The Public Health (First Series: Unsound Food) Regulations, 1908," and "The Public Health (Foreign Meat) Regulations, 1908."

The Public Health (First Series: Unsound Food) Regulations, 1908.—These Regulations have been framed with the object of securing that article of food which are unsound, unwholesome, or unfit for human consumption, and which as part of the cargo of a ship are brought to a place in this country either as a place of destination or as a place of deposit for transmission to a place of destination elsewhere in the United Kingdom shall be dealt with at the port of discharge. This procedure is necessary for the prevention of danger to the public health from the consumption of unsound

or unwholesome food. Inspection of articles of food for this purpose has for many years been carried out with satisfactory results by the Port Sanitary Authority in the Port of London, and more recently also in the Port of Manchester. The experience gained in these Ports has been utilised by the Board in preparing these Regulations, which enable action to be taken with regard to unsound food in all port sanitary districts and in all municipal boroughs and urban and rural districts which include or abut on any part of a Customs Port which part is not within the jurisdiction of a Port Sanitary Authority.

The Public Health (Foreign Meat) Regulations, 1908.—The Board have given attention to the danger to public health entailed by the unrestricted importation of certain kinds of meat foods, and to the circumstance that equitable and efficient administration by local authorities in respect of disease and unsoundness in meat may be seriously hampered by such importation.

The Regulations are designed to deal with foreign boneless meat which is imported in the form of scraps, trimmings, or other pieces not sufficiently identifiable with definite parts of a carcase, and which has not before importation been made ready for human consumption in the form of a sausage, or of another prepared or manufactured article of food; with imported tripe, tongues, or kidneys to which certain chemical preservatives have been applied; and with severed parts of a pig not prepared before importation as bacon or ham, and not contained in a package with an "official certificate" of the kind referred to below unopened on it or attached to it. These meats are classed together in the Regulations as "Foreign Meat of Class I," and unless the importer of meat of this class exports it at his own expense, or furnishes proof in the manner prescribed by the Regulations, that it is not intended for sale for human consumption, the meat is required to be destroyed.

With a view to stopping the importation of carcases of pigs from which the lymphatic glands about the throat and elsewhere are absent (thereby preventing the detection of evidence of tuberculosis and other disease in the carcase), the Regulations provide that carcases of pigs, not prepared as bacon or ham, which are imported without the lymphatic glands, and from which the head has been removed (Foreign Meat of Class II), shall be dealt with in a similar manner to Foreign Meat of Class I.

Foreign Meat of Class III consists of the severed parts of a pig, not prepared as bacon or ham, and not being Foreign Meat of Class I, but contained in a package with an "official certificate" attached as evidence that the pig from which the meat is derived has been certified by a competent authority in the place of origin to be free from disease at the time of slaughter, and that the meat has been certified by the like authority to have been dressed or prepared, and packed with the needful observance of all requirements for the prevention of danger arising to public health from the meat as an article of food. After the necessary communications with the responsible authorities of the countries concerned, the Board will take the steps contemplated by Article I (h) of the Regulations to define and publish the "official certificates" which are to be accepted for this purpose.

A further object of the Regulations is to provide means by which foreign meat generally which is diseased, unsound, unwholesome, or unfit for human consumption may be detected and dealt with by public health authorities at the place of importation.

Copies of the Regulations (Statutory Rules and Orders, No. 717 and 718), together with an explanatory Circular Letter, can be obtained from Messrs. Wyman and Sons, Limited, Fetter Lane, E.C.

American Gooseberry Mildew (Prohibition of Importation of Bushes) Amendment Order of 1908.

The Board of Agriculture and Fisheries have made an Order entitled the American Gooseberry Mildew (Prohibition of Importation of Bushes) Amendment Order of 1908, which provides that the provisions of the American Gooseberry Mildew (Prohibition of Importation of Bushes) Order of 1907 shall not extend or apply to bushes brought to Great Britain from the Channel Islands. The Order came into operation on the 16th of November, 1908.

This Order, which came into force on 8th December, 1908, defines a district comprising the administrative county of the Isle of Ely, and parts of the counties of the Parts of Holland, Norfolk, Huntingdon and Cambridge, within which gooseberry or currant bushes may not be moved without a licence signed by an Inspector of the Board, and prescribes the form of licence to be used both in the case of movement from infected and from other premises.

THE CORN MARKETS IN NOVEMBER.

C. KAINS-JACKSON.

The month of November, with its remarkably high average temperature, has brought permanently into consideration a matter on which most market frequenters will be found willing to express a decided opinion, though but few are in a position to submit any evidence bearing on the point, viz., to what extent weather affects demand. The probability is that its effect on retail consumption is much exaggerated, but that its influence on opinion is serious, and that that opinion affects large wholesale transactions, partly speculative, which do much to govern retail prices. The conditions of London trade are also peculiarly adverse to brisk markets in any November, for such conditions are expressed in the formula "a month as cash," and there is great unwillingness to enter into contracts entailing cash payments in December. The view of seasoned operators at the Mark Lane market on the 30th November appeared to be that the month had been traversed not unsatisfactorily.

Wheat.—The price of English wheat has been for the past three months of the cereal year 2s. 4½d. lower per 480 lb. than for the like period last year. But no Imperial average under 30s. has been quoted even in weeks of exceptionally heavy deliveries, and the mean price for the last week of the month was 32s. 3d., a decided recovery from the 30s. 11d. of the first week. Business has exceeded the average, and millers have expressed themselves surprised in many cases at the weight and bread-making strength of the newly-threshed corn. Very weak sorts of wheat have been so much denounced by millers of recent years, that they appear largely to have gone out of sowing use. Whether what millers ask for in wheat is what they should ask for is a matter of hypothesis, and one for the scientist and analyst to advise upon rather than the farmer himself, who in endeavouring to meet the requirements of his customer is fulfilling his more immediate duty. The steady and good demand for English wheat ever since harvest is due, in part, doubtless to the dry weather, enabling newly-threshed

corn to be delivered in milling condition, but the miller is also making his mixtures for the baker, his blends, and his patents, with an unusually large proportion of English wheat, and this may be taken as a general mark of appreciation. It has, however, even thus early in the cereal year an awkward correlative, and seeing that the home crop of 1908 is estimated to be 335,404 qrs. smaller than that of 1907, the increased sales and use of English wheat in the first three months argues supply difficulties later on. The Indian and Argentine new crops which will probably play a part of some importance in 1909 trade, cannot replace English wheat in mellowness and flavour. Russian wheat has been in only moderate supply, and the price in consequence has been stiffly supported at well over 40s. per 496 lb. off stands. It is, however, rather cheaper than at this time last year, for the Russian Statistical Bureau estimates the crop as larger than last year. Shipments appear to indicate very little difference. In the five weeks ended 28th November this year, they were 1,222,000 qrs. as compared with 1,266,000 qrs. for the five weeks ended 30th November, 1907. The United States have shipped less freely than in October, and average value at New York is now 2s. 4d. per 480 lb. higher than it was a year ago. There is a growing determination apparently to hold wheat in America for a rise; at the same time merchants are sustaining carrying and warehouse charges on 9,872,000 qrs. as compared with 7,761,000 qrs. last year, and this amounts to an appreciable increase in the pressure to sell. American wheat in London at the close of November made 38s. to 38s. 6d. for Durum, 39s. for Red Winter, and 40s. for Spring. At Liverpool Red Winter was just 1s. cheaper than in London on the quarter, as 7s. 11d. per cental just equals 38s. per 480 lb. Manitoba wheat is in request at 41s. to 42s. for fine quality. Argentine wheat supplies are now within a small compass; interest is concentrated on crop prospects, which are alleged to have declined by 6,000,000 qrs. in a month, i.e., the anticipated total yield was put at the end of October at 26,000,000 qrs., and at the end of November at 20,000,000. The damage done by night frosts, &c., looks as if it may have been exaggerated. Australian crop promise is regarded by Mark Lane firms as excellent, and several large cargoes for February shipment at 36s. 6d. per qr. found buyers before the close of the month. This wheat approaches more closely in character to English than do the majority of imported kinds. There are 90,000 qrs. on passage from India, but the supply on spot is too small adequately to test quotations. A speculative quotation, which in the absence of spot sales, may be mentioned is 38s. for June shipment of new White and 37s. 6d. of new Red from Karachi. The weight guaranteed with these shipments is 492 lb.

Flour.—The Hungarian fine flour, which heads market quotations, is dearer than ever. Despite a very fair home crop, Austria-Hungary is restricting offers to ship produce, and appears to be storing against contingencies. The price of the three great "marks" or brands—"Five Stars," "G.G.O." and "Victoria Empress," the latter, of course, a make peculiarly for England—has been raised to 43s. cash, and "Six Anchors" to 42s. 6d. cash. Of London makes "Special Whites" command 31s. 6d., "Extras" 30s. 6d., Household grade 28s. 6d. to 28s. 9d. All-English straights from East Anglian mills are quoted at 26s. per sack. Whole meal at 29s. per sack is, relatively speaking, dear, as on an average of years it is slightly cheaper than Household flour. Milling offals range from £5 to £7 per ton in price; the proportion of flour left in the ground product of course largely

governing the quotation. American flour is dearer on the month, the best grades of Minnesota and Wisconsin mills commanding 32s. 6d. These are spring patents. Fine American flour from winter wheat may perhaps be averaged at 30s. per sack. Argentina is shipping a small quantity of feeding flour at 18s. 6d. per sack, but the good quality types, named after heathen deities, which amused (but also, to some little extent, alarmed) English millers some three years ago, do not seem to be quoted or obtainable.

Barley.—The average price of English barley for the thirteen completed weeks of the cereal year is 26s. 11d. per 400 lb., a price showing 7d. advance on last season. In London a very low average—25s. 5d.—was quoted late in November, the sales of damaged and sprouted corn sometimes come in in bulk and temporarily depress the average. Fine malting barley is and has been in steady request at a good price. Some magnificent samples, practically unsurpassable, in fact, have been shown on the Old Corn Exchange from Bohemia and Austria. They fetch 42s., 44s. and even 46s. per 448 lb. Of course, there is no great bulk of supply behind them, but we are in a position to mention sales of quantities up to 500 qrs. Few English samples fetch over 38s. this season, but we have seen one lot at 41s., and have heard of a few others at 40s. per 448 lb. The great supplies of cheap feeding barley from Russia continue to be a feature of autumn trade, and Russia, in November, shipped 1,641,000 qrs. The ice, however, is now closing round some of the chief ports, and it may be noted that for December, 1907, the shipments from Russia did not exceed 606,000 qrs. Barley meal has been a fairly steady sale of late, 8s. per cwt. being an usual price, though where a ton is bought seven guineas may be given as about what is required to be paid.

Oats.—The average price of English oats for the thirteen completed weeks of the cereal year has been 17s. 1½d. per 312 lb. as compared with 18s. 2d. last season. This fall of rather over 1s. per qr. has discouraged farmers who have reduced their market deliveries very materially in consequence. The crop of 1908 is smaller than that of 1907 but the reduction in the market deliveries is larger in proportion. The most promising sign at Mark Lane on the 23rd and 30th was the demand for seed oats for early spring sowing. This looks as if the low currencies were not causing any permanent discouragement. Good 336-lb. oats make a guinea both in London and East Anglia, where the variety is named and the condition dry and fit, but in the west and south-west very poor prices rule, 2s. to 2s. 2d. per bushel at Okehampton on the 21st, 16s. 8d. per 312 lb. at so important a market as Chelmsford, also near the close of the month, by which time farmers had been hoping for a rise. The mild and muggy weather has probably been more against the sale of this than of any other cereal. The 304-lb. foreign sorts compete with each other at a level of 15s. 6d. to 16s., or thereabouts, while of imported oats which are to be considered among quality samples, one may name 320-lb. Königsberg at 18s. to 19s., and Chilian of the same weight at 20s. to 20s. 6d. New Zealand and heavy oats do not seem to be on offer, yet they sell without delay on account and often command as much as 24s. per qr.

Maize.—The markets remain limited in their choice to Argentine and south-east European types. Here and there a sample of South African at 29s. 6d. per qr. is to be met with, but British African Possessions have only recently attempted to grow maize for the London market. The very favourable reception accorded to the samples, especially by poultry-keepers

in search of small maize, should lead to an increased trade. The Argentine yellow maize at 27s. per qr. is rather poor stuff, and 29s. is asked for fine small round from Russia. Thus maize is a dear and difficult market for those who have run short of stocks. There are large offers to ship new American in January at 25s. 6d. to 27s. per qr., but total November shipments were 216,000 qrs. from North America, 595,000 qrs. from South America, 94,000 qrs. from Russia, and 158,000 qrs. from Roumania, Bulgaria and Salonica, and these totals are much below requirements. Imports of maize for the first three months of the present cereal year are estimated at about 2,225,000 qrs. only as compared with nearly 3,500,000 qrs. last season. The large shipments which North America is committed to in January and February therefore may already be discounted to the important extent of over 1,000,000 qrs., for that quantity will be absorbed in the operation of filling up depleted stores. The demand for maize flour (cornflour) at 24s. per sack of 280 lb. is steady and there are good sales of English-ground maize meal at £7 to £7 7s. per ton.

Pulse.—Some remarkably fine Dari from Persia has been fetching 36s. per 480 lb., and a good demand for like quality can be foreseen if India could grow it. There seems little reason to doubt the ability, and India might assure to Mark Lane that regularity of supply, in the absence of which, trade in Persian grain is never important. The sales of Beans have been rather good, and the dry weather has enabled growers to send to market samples which are not rejected because they do not attain "splitting quality." Peas are rather cheaper on the month. At 38s. 6d. for White Canadian and at 33s. 6d. for new English maple peas the purchaser should not do ill.

Oil Seeds.—The prices of the leading oil seeds do not vary much from the terms of a month ago, but one may note that Russian linseed at 47s. per 416 lb. is of high percentage of purity. Calcutta at 47s. is also worthy of attention, but the buyer should see that at this price he secures 416 lb.; the cargoes come over on a 410 lb. basis, and there are apt to be mistakes in the more retail trade. Argentine linseed is always sold per 416 lb., and is now in fair supply at 45s. or thereabouts. Morocco linseed is held for full fifty shillings; it is of such fine natural quality, and the country of growth is so near England as compared with Argentina and India, that the linseed merchants of those countries may well fear its competition.

Farm Seeds.—English Red Clover seed is offered by farmers at 30s. per cwt. less money than was asked a year ago. The cultivator can alone judge whether his surplus is so large as to justify this great reduction in the price which is 70s. for best against 100s. in 1907. White Clover seed makes 80s. per cwt. for best German, the sort for the moment most in evidence. English Fescue seed is in request at 95s. per cwt. or thereabouts. Foreign is so frequently rich in—dockseed!—that great care has to be taken in purchasing it. The high prices of farm seeds must be considered in connection with their small size and the small quantity required to sow an acre.

Minor Staples.—Ground linseed cake being a rapidly fattening food in a convenient form sells steadily. The first grade makes £8 15s. per ton, the second £8 10s. Other minor articles for which November has seen a certain inquiry include Potato Flour at £11 to £12 per ton, Split Lentils at 14s. per cental, Malt Screenings at three guineas per ton, and Sorghum at 24s. per 416 lb. The last named staple had been for several weeks unobtainable.

THE LIVE AND DEAD MEAT TRADE IN NOVEMBER.

A. T. MATTHEWS.

First Week. — From nearly all the markets reports of want of condition in the animals exposed for sale came in with even more emphasis than during October, and the scarcity of well-finished beasts was still more apparent. Trade was irregular. At some places the best cattle sold readily at previous prices, amongst them being Leicester, Bristol, Hull and Peterborough, but at Ashford, Hereford, Ipswich, Leeds, Newcastle and Darlington lower rates had to be quoted. At Ipswich and Norwich the best Shorthorns realised 8s. 3d. per 14-lb. stone, no other market, except Ashford, recording more than 8s. Wakefield was as low as 7s. 7d., which was the same as London, Leeds being the lowest on the list at 7s. 6d. The sheep trade was characterised by great dulness, but when we examine the actual quotations there does not appear to have been any serious or general decline. Taking, as usual, those for first quality "Downs," we find that London, Hereford and Wolverhampton declined $\frac{1}{2}d.$, Ipswich and Newcastle $\frac{1}{4}d.$ per lb., while Longwools at Ashford also made $\frac{1}{2}d.$ less; against these we have to place an advance of $\frac{1}{2}d.$ at Peterborough and Norwich. At Islington, on the 2nd, the few finished beasts of any breed were fully as dear as the week before, but there was more difference than usual between first and second quality, as the latter were cheaper by quite $\frac{1}{2}d.$ per lb., which caused a gap of $\frac{1}{2}d.$ per lb. between the two qualities instead of the usual farthing, as quoted when supplies are coming forward in their normal condition. It is quite certain that ordinary graziers have lost much this season through sparing the oilcake, the use of which would have paid them a liberal profit. It should not be forgotten that market reports in referring to the values of first and second quality are chiefly alluding to relative condition, and Shorthorn bullocks which were sold at Islington at 5 $\frac{3}{4}$ d. per lb. would, if well fattened, have made 3 $\frac{1}{2}$ d. per lb. more, or 50s. on a bullock weighing 800 lb., and, as the extra weight gained would have paid for the cake, the 50s. would have been all profit, besides the value of the manure. The mutton trade at Islington on the same day was much depressed, and although there was a fine show of Hampshire Down tegs of exactly suitable weights for the London demand, even these were sold with difficulty at 8d. per lb., while fine quality wethers of 80 lb. did not exceed 7 $\frac{1}{2}$ d.

The chief feature in the dead-meat trade this week was the sudden and heavy fall in American chilled beef. For several weeks this article had been very sparingly offered, owing, it was stated, to speculation for a rise in English, and the top price advanced to 7 $\frac{1}{4}$ d. per lb. for hind quarters, which was quite out of proportion to its usual relative value. During the week it suffered a reduction of 1 $\frac{1}{2}$ d. per lb., and was a slow trade at 6d. Scotch beef was a little cheaper at 6 $\frac{1}{2}$ d., but English and port-killed were firm at 5 $\frac{1}{2}$ d. per lb. Carcase mutton was again at a discount, Scotch tegs barely realising 7d. per lb. and the best English 6 $\frac{1}{2}$ d. Veal was cheaper than in October, nothing fetching more than 7d., and very good calves were procurable at 6 $\frac{1}{2}$ d. per lb. Pork partially recovered from the panic prices of the previous week and fetched from 5 $\frac{1}{2}$ d. to 6d. per lb. These prices relate to those ruling at the London Central Market.

Second Week.—There was a very general and decided improvement in the demand for cattle in the second week, and in a few places a rather sharp rise in prices. Ipswich advanced 6d. per 14-lb. stone, and 8s. 9d. was again recorded. Peterborough went up 5d., Derby 4d., Norwich and Lincoln 3d., Leicester alone declining 2d. But even where there was no quotable advance there seemed almost everywhere more disposition to make offers, and markets were cleared, even of second quality animals, with greater ease. This was especially noticeable in London on the 9th, where no advance was made on the best cattle, but secondary classes made $\frac{1}{4}$ d. per lb. more than the previous week. It is perhaps worth recording that two handsome young Shorthorn cows, which had only had one calf, fetched £20 10s. each, a noticeable instance of what quality will do even with London "drape" cows, seeing that £16 each was about the average for the useful fat cows standing beside them. On the same day the sheep trade also revived a little, but the improvement was confined to those of prime quality and small weights, of which there were few in the market. Hampshire tegs were again sold at 8½d. per lb., sinking the offal, and Scotch wethers 8d., this being an advance of $\frac{1}{2}$ d. and $\frac{1}{4}$ d. per lb. respectively. Heavy sheep were comparatively slow of sale. In the country the markets generally showed no improvement, the same reluctance on the part of butchers to do business, which had so long prevailed, being still apparent. They complained that there was no profit to be made out of sheep at present prices. London and Wolverhampton recorded an advance of $\frac{1}{2}$ d. for prime Downs, but Dorchester and Shrewsbury were lower by $\frac{1}{4}$ d. With these exceptions there was no quotable change in prices worth mentioning.

The trade for fat pigs was better in many places with a slight advance, but the movement was not general. Bacon pigs were cheap in proportion to the wholesale prices of dried English bacon, which is reported as scarce and dear by factors.

In the dead-meat market at Smithfield prime beef was very firm, and the chief cause of the low quotation for English beef was its deficiency in quality as is shown by the relatively high prices of Scotch. Short sides were in demand at 7½d. per lb., and whole or "long" sides at 6½d. for first quality. More striking than this was the price realised for a few carcases of Welsh Runts consigned direct from the country and thoroughly well fed. These exceptionally fine sides made 6d. per lb., which was $\frac{1}{2}$ d. more than the best Deptford killed, and $\frac{1}{2}$ d. per lb. more than the highest quotation for English beef for the previous week, when the quality was only of the usual character. This incident helps to explain why port-killed beef in the Central Market is so often quoted somewhat higher than English. The former is the best of its class, while the primest English is so seldom sent to the dead-meat market. At the same time it should be observed that the quality of that usually on offer is too good to be quoted as "second."

The trade for other classes of beef showed little change, except that Argentine chilled was reduced by $\frac{1}{2}$ d. per lb., best hind quarters only fetching 4½d. The transactions in frozen beef were extremely small. There was virtually no alteration in the value of British mutton, demand being still limited, and some of the larger Dutch carcases selling as low as 4½d. per lb.

Pork and veal were a quiet trade, pork firm in price and veal being quoted at 7d. per lb. for second quality. It frequently happens that there is no British veal at Smithfield which can be quoted as first quality.

Third Week.—After the distinctly more cheerful tone so generally prevailing during the preceding week in the trade for cattle, the market at Islington proved a disappointing one. The choicer qualities amongst those on offer on the 16th were equally neglected with those in indifferent condition, and the value of Devons, Herefords and Welsh Runts was reduced by $\frac{1}{4}d.$ per lb. A slight improvement amongst the Shorthorns was sufficient to save the best of them from being quoted lower than the previous week, but the demand was so weak that all could not be disposed of and many left the market unsold.

The paucity of buyers in the sheep market was very marked, and it was said that the attendance was smaller even than that usually seen on a Bank Holiday. Even for the small muster of 4,230 head there were too few customers, and, of course, under such circumstances prices gave way; the best Downs of small weight were sold at 8*d.* per lb., and Cheviots at 8*1/4d.* There was far too large a supply of coarse, heavy Longwools, many of them weighing 96 lb., and totally unsuitable for the London trade even when it is fairly good, but at a time like the present they add to the depression of an already dull market. The sheep alluded to more particularly are Romney Marsh wethers—not ewes, but “shearhogs” of two years old.

There was little change in the value of beef in the country markets. The fact that prime Shorthorns fetched 9*s.* per 14-lb. stone at Ipswich, 8*s.* at Norwich, Dorchester, Bristol, Lincoln, Hull and Newcastle, and only 7*s. 7d.* at London, Leicester, Leeds and Wakefield, forms a very practical comment on the extraordinary variations of quality in different parts of the country in the present peculiar grazing season.

The average price of mutton again declined to a small extent. Most of the markets reported no change, but a fall of $\frac{1}{4}d.$ per lb. took place at Wolverhampton and Hull. The highest price of “Downs” was recorded at Chichester, where the first quality fetched 9*d.* per lb. Here, of course, we have the question of breed, as the Sussex Downs are naturally well represented at Chichester, and nothing can touch them for value per lb.

The Central Meat Market in this third week presented an unusual feature, and one specially interesting when we recall the events of last summer in connection with the supplies of chilled beef. There was a further heavy fall in the value of this article, bringing down the price of best American hind quarters to 3*s. 4d.* per 8 lb., and that of Argentine to 2*s. 6d.*, second qualities being 2*s. 8d.* and 2*s.* respectively. The effect of this was to suspend the sale of frozen beef so that no quotations could be given. All fresh beef was a little easier except Scotch. Mutton continued its downward course in values, and the finest small Scotch carcasses only fetched 6*3/4d.* and English 6*1/4d.* per lb. Dutch was plentiful at 5*d.* to 6*d.* per lb.

Fourth Week—The supplies at Islington on the 23rd were of much the same medium quality which has been the rule all the autumn, no stall-fed cattle as yet putting in an appearance. Although sales were effected more easily there was no advance in prices. The best Shorthorns present had still to be quoted at 7*s. 7d.* per 14-lb. stone, which compared badly with all other markets giving an official return except Wakefield, which recorded the same low rate. Ipswich was again the highest market in England for Shorthorns, overtaking all others by 9*d.* per stone. Three other markets were 3*d.* per stone dearer on the week, viz.:—Leicester, Norwich and Leeds,

Peterborough advancing 5d. As the Scotch markets were generally very firm, we are justified in describing the beef trade as being rather better, especially as second quality was relatively dear. Middling beasts have in fact been making more money than at this time last year.

Fat sheep again met with a very dull trade almost everywhere, especially for heavy wethers and ewes. London, Dorchester and Wolverhampton, however, quoted best quality Downs $\frac{1}{4}$ d. per lb. higher, Derby declining to the same extent. There was thus, practically, no change in the actual value of sheep. There was, on the whole, a better demand for fat pigs and rather higher prices were realised in many places.

The improved tone in the country for fat cattle was reflected to some extent at Smithfield dead-meat market. Scotch beef continued firm at former values and English also was a fairly good trade, allowing for the absence of any sides of really choice quality. Chilled recovered slightly, but the trade in frozen was little more than nominal. Mutton, although still depressed by the glut of Dutch carcasses, was rather more saleable, and choice small weights advanced $\frac{1}{2}$ d. per lb. Veal was quiet but about maintained values, while pork was very heavy to sell at a reduction of $\frac{1}{2}$ d. per lb.

As regards the trade in Stores there has been a great contrast between cattle and sheep. There has been everywhere an excellent demand for strong forward cattle at fully last year's prices, but sheep have often been almost unsaleable.

THE PROVISION TRADE IN NOVEMBER.

HEDLEY STEVENS.

Bacon.—The past month has again been unsatisfactory both in regard to quantity consumed and profits. Arrivals from Denmark have been fairly heavy, taking into consideration the slow trade, and as the mild weather necessitated a quick sale for such goods, prices were generally in buyers' favour, showing on the month a drop of from 3s. to 5s. per cwt. This brought down the prices of other side meats including English, but not to the same extent. Hogs in Canada are still scarce and high in price. Packers of Canadian bacon cable that the prices realized for their goods in England at the end of the month, show them a loss of from 7s. to 8s. per cwt. American bacon and hams show general reductions in prices in England, and they are said to be below the cost of production. Hogs are being marketed freely in America, but are below the average weight. There has been a fair demand for English and Irish bacon, but Danish being cheaper has proved a strong competitor.

Cheese.—The demand has again been very disappointing, and, except in a few cases, merchants have found it impossible to make even cost prices for best selections. On account of the high range of prices, grocers are giving more attention to under-priced lots, supplies of which are not large, and consequently show less than the usual margin in price below best goods. There has been on offer a larger quantity of inferior English cheese, which in some districts is taking the place of the under-priced Canadian makes.

Shipments from Montreal from 1st May to 18th November were 1,709,937 boxes, against 1,912,653 boxes for the same period in 1907, showing

decrease of 202,720 cheese. New York has shipped us 83,437 boxes this year, as against 31,429 during the corresponding period last year, an increase of 52,008 cheese, or a total decrease of over 150,000 cheese. The estimated stocks of Canadian cheese at the end of the month in the three principal distributing ports (London, Liverpool and Bristol) are 397,000, against 386,000 last year, an increase this year of 11,000, which, with the decreased receipts into the country of 150,000, shows a considerable reduction in the consumption of cheese from Canada and the United States. Stocks left in Canada are stated to be less than at the same time last year, but it is difficult to arrive at a correct estimate, the various reports being so conflicting. The first arrival of New Zealand reached London the third week in November, and the quality is reported to be satisfactory, considering the early make. Sales were made at 59s. to 60s. per cwt.

On account of the abnormally mild weather during the month, with plenty of grass, English cheese makers have continued their operations longer than usual, and, although the quality has been irregular, their product has found ready markets at the prices asked in competition with Canadian, on account of the prevailing high prices of the latter.

Butter.—Chiefly on account of the exceptionally mild weather during the entire month, and the abnormally high prices at the commencement of the month, the demand has been very disappointing. Buyers have continued their hand-to-mouth policy, and anticipations as to lower prices proved correct, as by the end of the month prices on imported lots had fallen 8s. to 12s. per cwt., with still further reductions expected, unless the weather should suddenly turn cold.

Supplies from the Colonies and from foreign countries continued to be much in excess of the demand, and in addition, the weather conditions being favourable, there has been a larger English make for the month than for many years past, which had to be consumed and so took the place of imported lots. Cables report shipments from Australia, from 1st July to the end of November, about 2,000 tons less than the corresponding period last year, and 4,000 below the same period of the previous year. Letters from the United States dated 18th November, report:—Fresh special creamery butter making equal to 146s. per cwt., and ordinary finest 140s. to 142s. Stored lots of summer makes 128s. to 134s. per cwt. Prices in Canada are also above an export basis.

Eggs.—There has been a good demand throughout the month with best selections in small supply, large weights realizing tall prices. Pickled eggs have been largely drawn on earlier than usual, and have realized good prices, in some cases 8d. to 10d. per hundred advance being paid above prices current when the contracts were entered into. English are especially scarce, and generally high prices are anticipated for December, when the Christmas requirements will be filled. Irish are fetching 1s. to 1s. 6d. above their market value at this time last year.

The *Montreal Trade Bulletin* of 13th November reports: "There has been a firm feeling in the Egg Market, and prices show a further advance of 1 cent per dozen, making an advance of 2 to 2½ cents per dozen during the past two weeks. The trade reports that the demand for eggs is very heavy, being unprecedented for this time of year. There have been very few lots of Canadian eggs gone forward to the English markets, the total exports this season to date only amounting to 6,710 cases." These cases contain 360 eggs.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND
in the Month of November, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—				
Cattle :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Polled Scots	s. d.	s. d.	s. d.	s. d.
Herefords	7 10	7 6	39 8	35 9
Shorthorns	7 11	7 6	—	—
Devons	7 11	7 3	38 10	35 1
per lb.*	per lb.*	per lb.*	per lb.*	per lb.*
d.	d.	d.	d.	d.
Veal Calves	8	7	8½	6½
Sheep :—				
Downs	8	7	—	—
Longwools	7½	6½	—	—
Cheviots	8	7½	7½	7½
Black-faced	7½	6½	7	6½
Cross-breds	7½	7	8	7
Pigs :—	per stone.*	per stone.*	per stone.*	per stone.*
Bacon Pigs	s. d.	s. d.	s. d.	s. d.
Porkers	6 3	5 9	6 3	5 7
"	6 8	6 3	6 8	5 11
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	21 12	18 5	21 1	17 4
" —Calvers ...	21 2	18 2	20 6	17 0
Other Breeds—In Milk	21 17	18 5	19 14	16 7
" —Calvers ...	15 0	14 10	20 1	16 4
Calves for Rearing	2 3	1 13	2 2	1 11
Store Cattle :—				
Shorthorns—Yearlings ...	10 9	8 18	10 2	8 4
" —Two-year-olds ...	14 6	12 11	14 17	12 7
" —Three-year-olds	17 3	15 9	16 5	13 15
Polled Scots—Two-year-olds	—	—	15 10	13 5
Herefords—"	15 9	14 4	—	—
Devons—"	15 8	14 2	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs, and Lambs—				
Downs or Longwools ...	36 7	31 2	—	—
Scotch Cross-breds ...	—	—	25 7	22 0
Store Pigs :—				
Under 4 months	21 8	15 2	21 4	17 1

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of November, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birming-ham.	Man-chester.	Liver-pool.	Glas-gow.	Edin-burgh.
BEEF :—		per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
English	1st 52 0	50 6	49 0	51 6	59 6*	55 6*
Cow and Bull	2nd 48 0	46 6	45 0	46 6	51 6*	49 0
U.S.A. and Cana-dian :—		1st 41 0	44 6	41 6	41 0	41 0	43 0
Port killed	2nd 32 6	39 6	35 6	35 6	31 6	36 6
Argentine Frozen—							
Hind Quarters	1st 35 6	36 0	35 0	35 0	35 0	36 0
Fore	” ”	1st 30 6	31 6	30 6	30 6	29 6	31 0
Argentine Chilled—							
Hind Quarters	1st 39 6	40 0	39 0	39 0	40 6	41 0
Fore	” ”	1st 30 6	32 0	32 0	31 0	32 0	31 0
American Chilled—							
Hind Quarters	1st 52 0	55 0	53 6	53 6	51 6	56 6
Fore	” ”	1st 35 6	37 6	36 0	36 0	36 0	39 0
VEAL :—							
British	1st 65 6	60 6	69 6	71 0	—	—
Foreign	2nd 59 6	51 6	64 6	65 6	—	—
Foreign	1st 67 0	—	—	—	—	69 6
MUTTON :—							
Scotch	1st 64 0	—	65 6	65 6	65 6	59 6
English	2nd 58 6	—	60 6	60 6	49 6	50 0
U.S.A. and Cana-dian—							
Port killed	1st —	58 6	—	53 6	—	—
Argentine Frozen	1st 34 0	34 6	34 0	34 0	32 6	33 6
Australian	” ”	1st 31 6	34 0	31 6	31 6	—	—
New Zealand	” ”	1st 39 6	—	—	—	39 6	—
LAMB :—							
British	1st —	—	—	—	—	—
New Zealand	2nd —	—	—	—	—	—
Australian	1st 54 0	54 0	51 6	51 6	55 0	—
Argentine	1st 48 0	48 6	46 0	46 6	42 0	—
PORK :—							
British	1st 55 0	59 0	62 0	63 0	53 6	53 6
Foreign	2nd 49 0	55 6	56 6	57 0	51 6	46 6
Foreign	1st 55 6	54 0	55 0	55 0	—	—

* Scotch.

AVERAGE PRICES of Wheat, Barley, and Oats per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

	WHEAT.		BARLEY.		OATS.	
	1907.	1908.	1907.	1908.	1907.	1908.
France :	October ...	s. d.	s. d.	s. d.	s. d.	s. d.
	November ...	39 10	38 8	25 7	25 11	19 9
Paris :	October ...	40 2	38 4	25 11	25 9	20 1
	November ...	39 3	39 2	26 3	26 2	19 4
Belgium :	September ...	38 5	39 4	26 2	25 0	19 0
	October ...	34 7	34 3	25 11	24 9	20 9
Germany :	September ...	36 7	34 3	27 4	25 3	19 11
	October ...	46 11	42 1	30 0	29 10	23 8
Berlin :	September ...	48 9	42 1	32 4	31 1	24 4
	October ...	48 1	44 3	—	—	22 2
Breslau :	September ...	48 11	43 10	—	—	22 9
	October ...	46 7	40 11	(brewing) 29 6 26 6 (other) 31 6	(brewing) 30 8 26 0 (other) 30 8	24 6
	October ...	47 7	41 3	(brewing) 26 8 (other)	(brewing) 26 0 (other)	22 2
						21 1

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets. The mark is now taken as equal to 11·8d., and the German prices for the former year have been recalculated on this basis.

AVERAGE PRICES of British Wheat, Barley, and Oats at certain Markets during the Month of November, 1907 and 1908.

	WHEAT.		BARLEY.		OATS.	
	1907.	1908.	1907.	1908.	1907.	1908.
London...	... ...	s. d.	s. d.	s. d.	s. d.	s. d.
	36 6	33 1	28 7	27 5	19 7	18 3
Norwich	... ...	34 10	30 11	27 5	27 3	18 6
Peterborough	... ...	34 9	31 2	27 2	27 5	18 3
Lincoln...	... ...	34 9	30 11	27 6	27 1	18 6
Doncaster	... ...	34 7	30 8	27 7	27 0	18 8
Salisbury	... ...	35 6	31 5	27 8	27 6	18 10
						17 5

AVERAGE PRICES of British Corn per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1906, 1907 and 1908.

Weeks ended (in 1908).	Wheat.			Barley.			Oats.		
	1906.	1907.	1908.	1906.	1907.	1908.	1906.	1907.	1908.
Jan. 4	28 4	26 0	35 1	24 6	23 11	26 9	18 2	17 3	18 4
" 11	28 6	26 1	35 2	24 8	24 2	26 9	18 4	17 4	18 3
" 18	28 5	26 1	35 5	24 11	24 1	27 1	18 4	17 5	18 5
" 25	28 7	26 2	35 6	25 1	24 5	26 11	18 7	17 5	18 5
Feb. 1	28 10	26 3	35 0	25 1	24 4	26 11	18 10	17 5	18 4
" 8	28 10	26 6	34 3	25 3	24 5	26 9	18 10	17 7	18 3
" 15	28 11	26 7	33 1	25 6	24 1	26 9	19 0	17 7	18 0
" 22	28 10	26 10	32 6	25 4	24 2	26 5	19 0	17 9	17 11
" 29	28 8	26 9	30 11	25 0	24 2	26 3	19 0	17 9	17 8
Mar. 7	28 5	26 8	30 5	25 1	23 11	26 1	18 8	17 11	17 8
" 14	28 5	26 10	31 3	24 8	24 2	26 0	18 10	0 17	17 10
" 21	28 4	26 10	31 7	24 4	24 0	26 2	18 8	18 1	17 11
" 28	28 3	26 8	31 4	24 5	23 9	25 10	18 11	18 2	17 10
Apl. 4	28 7	26 9	31 3	24 2	24 3	25 5	18 11	18 3	17 9
" 11	28 11	26 8	31 2	24 4	23 9	25 10	19 4	18 6	17 7
" 18	29 4	26 8	30 11	24 0	23 3	26 1	19 1	18 7	17 7
" 25	29 6	26 10	30 10	24 0	23 3	25 5	19 6	18 9	17 9
May 2	29 10	27 0	31 6	23 10	23 6	25 8	19 9	19 3	18 0
" 9	30 1	27 6	32 4	24 1	24 0	25 5	20 0	19 7	18 4
" 16	30 3	28 4	33 1	23 10	24 9	20 1	20 1	18	7
" 23	30 4	29 7	33 8	24 2	24 3	25 9	20 2	20 5	18 10
" 30	30 4	31 4	33 5	22 10	24 0	24 6	20 5	20 8	18 8
June 6	30 3	32 0	33 1	23 4	24 7	25 10	19 11	20 7	18 4
" 13	30 4	31 10	32 7	23 6	24 7	24 5	20 2	20 11	18 4
" 20	30 5	31 4	32 0	22 10	24 11	24 2	20 2	20 9	18 5
" 27	30 3	31 2	31 5	24 3	24 6	24 0	20 1	20 8	18 7
July 4	30 2	31 3	30 11	23 0	24 8	23 11	20 2	20 11	18 7
" 11	30 5	32 0	30 5	23 8	24 10	24 4	20 4	20 11	18 5
" 18	30 3	32 6	30 7	23 2	24 6	23 1	20 5	21 1	18 5
" 25	30 5	32 11	31 5	22 4	27 3	26 5	20 2	20 8	18 6
Aug. 1	30 9	33 2	31 10	22 1	26 4	24 4	19 3	21 2	18 7
" 8	30 5	33 5	31 6	23 0	26 6	23 1	17 11	21 3	18 9
" 15	29 0	33 6	31 6	24 2	25 9	23 10	17 0	20 4	18 1
" 22	27 9	33 7	31 2	25 0	25 0	24 5	16 10	19 8	17 10
" 29	26 9	33 10	30 10	24 3	24 6	24 5	16 6	18 11	17 1
Sept. 5	26 4	31 11	30 10	24 9	24 2	25 5	16 3	17 7	17 3
" 12	25 11	31 4	31 5	24 3	24 4	25 11	16 1	17 6	17 6
" 19	25 9	31 5	31 7	24 3	25 0	26 0	16 0	17 6	17 3
" 26	25 9	31 8	31 5	24 8	25 3	26 8	16 2	17 8	17 2
Oct. 3	25 9	31 8	31 5	24 8	25 3	26 8	16 3	17 9	17 2
" 10	26 3	33 3	31 5	25 3	25 9	27 5	16 7	17 11	17 0
" 17	26 6	34 4	31 2	24 10	26 3	27 6	16 8	18 0	17 0
" 24	26 7	35 9	30 11	24 10	27 2	27 5	16 10	18 7	16 11
" 31	26 7	36 3	30 8	24 8	27 7	27 5	16 11	18 10	16 11
Nov. 7	26 6	35 10	30 11	24 8	27 8	27 6	17 1	18 10	17 0
" 14	26 4	35 1	31 2	24 4	27 8	27 4	17 2	18 8	17 0
" 21	26 3	34 7	31 10	24 1	27 5	27 3	17 3	18 9	17 3
" 28	26 1	34 7	32 3	24 1	27 5	27 2	17 2	18 7	17 5
Dec. 5	26 1	34 7	32 7	24 1	27 1	27 2	17 4	18 6	17 4
" 12	26 1	34 8	32 7	23 11	27 0	17 3	18 5		
" 19	26 3	34 9	32 7	24 3	27 1	17 3	18 3		
" 26	26 0	34 6	32 7	24 1	26 10	17 3	18 0		

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates : Wheat, 60 lbs. ; Barley, 50 lbs. ; Oats, 39 lbs. per Imperial Bushel.

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of November, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Bristol.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
BUTTER :—	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
British ...	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
	14 6	13 0	15 0	13 9	—	—	15 0	—
Irish Creamery ...	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
" Factory	122 0	119 0	125 0	120 0	120 0	116 6	121 6	—
Danish ...	112 6	107 0	110 0	106 0	110 0	104 0	—	—
Russian ...	113 6	109 0	114 0	108 0	113 6	108 6	111 6	105 6
Canadian ...	120 0	118 0	121 0	115 0	119 6	116 6	—	—
New Zealand	124 0	122 6	120 0	118 0	118 0	115 0	—	—
CHEESE :—								
British—								
Cheddar ...	80 0	70 6	76 0	63 0	74 6	69 0	64 0	60 0
	120 lb.	120 lb.			120 lb.	120 lb.		
Cheshire ...	81 6	62 6	—	—	69 0	62 6	—	—
	per cwt.	per cwt.			per cwt.	per cwt.		
Canadian ...	62 0	60 6	61 6	59 6	61 6	59 6	62 0	59 6
BACON :—	.							
Irish	62 6	58 6	65 0	59 6	62 6	57 6	65 0	59 0
Canadian	54 6	52 6	58 0	54 0	54 0	51 0	57 6	55 0
HAMS :—								
Cumberland ...	105 0	92 6	—	—	—	—	—	—
Irish	105 0	93 0	—	—	—	—	97 0	86 6
American (long cut) ...	53 6	51 0	53 0	51 0	53 0	48 0	53 0	50 6
Eggs :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British ...	19 4	16 8	19 2	16 10	15 0	—	—	—
Irish	16 7	14 1	15 1	13 7	14 7	12 1	14 10	12 6
Danish ...	16 5	14 6	13 10	12 10	15 3	14 0	14 4	12 3
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Langworthy ...	71 0	62 6	—	—	81 6	71 6	47 0	41 0
Scottish								
Triumphs ...	63 6	53 6	65 0	57 6	40 0	35 0	50 0	45 0
Up-to-Date ...	65 0	52 6	61 0	51 0	40 0	35 0	40 0	37 6
AY :—								
Clover ...	89 0	72 0	72 6	—	85 0	62 6	66 0	61 0
Meadow ...	72 0	55 6	65 0	—	—	—	52 6	47 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.**NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.****GREAT BRITAIN.***(From the Returns of the Board of Agriculture and Fisheries.)*

DISEASE.	NOVEMBER.		11 MONTHS ENDED NOVEMBER.	
	1908.	1907.	1908.	1907.
Swine-Fever :—				
Outbreaks	173	128	1,935	2,229
Swine Slaughtered as diseased or exposed to infection ...	1,821	617	12,704	10,684
Anthrax :—				
Outbreaks	93	76	1,014	988
Animals attacked	104	105	1,315	1,327
Foot-and-Mouth Disease :—				
Outbreaks	—	—	3	—
Animals attacked	—	—	112	—
Glanders (including Farcy) :—				
Outbreaks	51	59	742	794
Animals attacked	175	120	2,317	1,795
Sheep-Scab :—				
Outbreaks	69	93	732	540

IRELAND.*(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)*

DISEASE.	NOVEMBER.		11 MONTHS ENDED NOVEMBER.	
	1908.	1907.	1908.	1907.
Swine-Fever :—				
Outbreaks	3	5	155	144
Swine Slaughtered as diseased or exposed to infection ...	29	218	3,563	2,632
Anthrax :—				
Outbreaks	—	—	7	3
Animals attacked	—	—	10	5
Glanders (including Farcy) :—				
Outbreaks	—	—	—	5
Animals attacked	—	1	—	10
Sheep-Scab :—				
Outbreaks	31	28	333	240

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of November, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Bristol.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
BUTTER :—			s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
British	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
... 14 6	13 0	15 0	13 9	—	—	—	15 0	—
Irish Creamery	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Factory 122 0	119 0	125 0	120 0	120 0	116 6	121 6	—	—
„ Danish 112 6	107 0	110 0	106 0	110 0	104 0	—	—	—
„ Russian 113 6	109 0	114 0	108 0	113 6	108 6	125 0	—	—
Canadian 120 0	118 0	121 0	115 0	119 6	116 6	—	—	—
New Zealand 124 0	122 6	120 0	118 0	118 0	115 0	—	—	—
CHEESE :—								
British—								
Cheddar ...	80 0	70 6	76 0	63 0	74 6	69 0	64 0	60 0
	120 lb.	120 lb.			120 lb.	120 lb.		
Cheshire ...	81 6	62 6	—	—	69 0	62 6	—	—
	per cwt.	per cwt.			per cwt.	per cwt.		
Canadian ...	62 0	60 6	61 6	59 6	61 6	59 6	62 0	59 6
BACON :—								
Irish ...	62 6	58 6	65 0	59 6	62 6	57 6	65 0	59 0
Canadian ...	54 6	52 6	58 0	54 0	54 0	51 0	57 6	55 0
HAMS :—								
Cumberland ...	105 0	92 6	—	—	—	—	—	—
Irish ...	105 0	93 0	—	—	—	—	97 0	86 6
American (long cut) ...	53 6	51 0	53 0	51 0	53 0	48 0	53 0	50 6
Eggs :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British ...	19 4	16 8	19 2	16 10	15 0	—	—	—
Irish ...	16 7	14 1	15 1	13 7	14 7	12 1	14 10	12 6
Danish ...	16 5	14 6	13 10	12 10	15 3	14 0	14 4	12 3
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Langworthy ...	71 0	62 6	—	—	81 6	71 6	47 0	41 0
Scottish								
Triumphs ...	63 6	53 6	65 0	57 6	40 0	35 0	50 0	45 0
Up-to-Date ...	65 0	52 6	61 0	51 0	40 0	35 0	40 0	37 6
HAY :—								
Clover ...	89 0	72 0	72 6	—	85 0	62 6	66 0	61 0
Meadow ...	72 0	55 6	65 0	—	—	—	52 6	47 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	NOVEMBER.		11 MONTHS ENDED NOVEMBER.	
	1908.	1907.	1908.	1907.
Swine-Fever :—				
Outbreaks	173	128	1,935	2,229
Swine Slaughtered as diseased or exposed to infection ...	1,821	617	12,704	10,684
Anthrax :—				
Cutbreaks	93	76	1,014	988
Animals attacked	104	105	1,315	1,327
Foot-and-Mouth Disease :—				
Cutbreaks	—	—	3	—
Animals attacked	—	—	112	—
Glanders (including Farcy) :—				
Outbreaks	51	59	742	794
Animals attacked	175	120	2,317	1,795
Sheep-Scab :—				
Outbreaks	69	93	732	540

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	NOVEMBER.		11 MONTHS ENDED NOVEMBER.	
	1908.	1907.	1908.	1907.
Swine-Fever :—				
Outbreaks	3	5	155	144
Swine Slaughtered as diseased or exposed to infection ...	29	218	3,563	2,632
Anthrax :—				
Outbreaks	—	—	7	3
Animals attacked	—	—	10	5
Glanders (including Farcy) :—				
Outbreaks	—	—	—	5
Animals attacked	—	1	—	10
Sheep-Scab :—				
Outbreaks	31	28	333	240

ADDITIONS TO THE LIBRARY.

[NOTE.—The receipt of annual publications of foreign agricultural and other departments, experiment stations and societies is not noted in the monthly list of additions to the Library, but a list of those publications, which are regularly received, will be published at a later date.]

Great Britain—

Wright, Professor R. Patrick.—The Standard Cyclopaedia of Modern Agriculture and Rural Economy. Vol. 2. AUS—BRO. (240 pp.) London: Green & Sons Publishing Company, 1908. 8s. net.

Shuckard, W. E.—British Bees. (371 pp. + xvi plates.) London: L. F. Reeve and Co., n.d. 9s. net.

Watt, Sir George.—The Commercial Products of India. (1,189 pp.) London: John Murray, 1908. 16s. net.

University College of Wales, Aberystwyth.—Third Annual Report on Experiments, 1907-08. The Feeding of Cattle; the Feeding of Pigs; Variations in the Quantity and Quality of Milk; the Manuring of Meadow Land. (2 vols. 8 pp.) Aberystwyth, 1908.

Bean, W. J.—The Royal Botanic Gardens, Kew. (222 pp. + 20 reproductions in colour and 40 half-tone plates.) London: Cassell and Co., 1908. 20s. net.

West of Scotland Agricultural College.—Report on Experiments made in 1905 on Varieties of Oats: their botanical character and the influence of manures thereon (127-161 pp.) Report on Experiments on Varieties of Oats (1902-07). Section III: Dressed Grain. (167-193 pp.) Section IV: Componants of Dressed Grain. (199-220 pp.) 1907-08.

Nuttall, G. H. F., Warburton, C., Cooper, W. F., and Robinson, L. E.—Ticks: a Monograph of the Ixodoidea. Part I: Argasidae (104 pp. + 3 plates) with Bibliography. (33 pp.) Cambridge: University Press, 1908. 5s. net.

[Arrangements have been made for the remaining parts of this work to be added to the Library as issued.]

Edinburgh and East of Scotland College of Agriculture.—The Variation in the Composition of Milk. Third Annual Report on the work at Rosslynlee, 1907-08. (35 pp.) Edinburgh, 1908.

Lancaster County Council.—Report of Experiments on the Liming of Meadow Land, 1905-08. (12 pp.) Preston, 1908.

Bedfordshire County Council.—Report upon the Wheat Plots, 1908. (4 pp.)

Dunstan, Professor Wyndham.—Report on Agriculture in Asia Minor, with special reference to cotton cultivation. [Cd. 4324.] (18 pp.) London: Wymans, 1908. 1s.

Austria-Hungary—

Verhandlungen des XXII Österreichischen Forstkongresses, 1908. (235 pp.)

Germany—

Oehme, M. Wiesenbau auf Moorboden. (40 pp.) Berlin: Paul Parey, 1908. 80 pf.

Deutsche Landwirtschafts-Gesellschaft.—Arbeiten. Heft 148. Betriebsverhältnisse der deutschen Landwirtschaft. Stück VI der Sammlung. Berlin: Paul Parey, 1908. 3 m.

Berichte des Deutschen Landwirtschaftsrats an das Reichsamt des Innern:—

Untersuchungen über die Wirkung des Nahrungsfettes auf die Milchproduktion der Kühe, ausgeführt an verschiedenen landw. Versuchsstationen:—
A. Allgemeiner Bericht. (32 pp.) B. Spezialberichte der Versuchsansteller. (411 pp.) Berlin: Paul Parey, 1907-08.

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EXPENSES OF CORN HARVESTING.

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The beginning of the twentieth century finds the profits on corn-growing so low that the producer must examine with the greatest care the various systems under which it is grown in order to reduce the cost of production to a minimum. For this purpose reliable and accurately ascertained data are required, but unfortunately nothing of the sort seems to be available. When writing of the sickle or scythe, authors of a past generation had at least long experience to guide them, whereas as regards the working of the binder and elevator—comparatively new-born implements, and very much more complicated—practically all information is wanting. The harvest of 1905, therefore, was spent by the present writer on a corn farm, or rather two farms thrown into one, in East Anglia, for the purpose of gathering such information as was possible in so short a time. There were 300 acres of wheat and barley and a small acreage of oats harvested, but unless otherwise specified the deductions drawn from these observations apply to wheat and barley only. The particulars ascertained can only be regarded as a preliminary effort, and though the work is slow and tedious, it is hoped more data may in the future be gathered by other observers in different localities and from different methods. Every care was taken to record things happening under normal conditions. Farm hands will at first move faster when being timed or even

closely watched, but this stimulus is soon seen to work off, and then the man with note-book, chain, and weighing machine day by day becomes a mere adjunct to the ordinary personnel of the harvest field.

Weight of Binder Sheaf.—It was difficult to get any sort of data as to the weight of sheaf thrown by the binder, the various makers being extremely vague in their statements on the matter. The following tables taken from the two farms under varying conditions represent the average results obtained by three different makes of machines.

TABLE I.—Average Weight of Sheaves. (Wheat.)

		Total.
1 weighed	10·5 lb. (carting) ...	10·5
16 averaged	11·5 " from 9·5 to 13·0 lb. (carting) .	184·0
14 "	9·1 " 8·0 " 10·5 " (pitching) ...	127·0
4 "	11·5 " 11·0 " 12·0 " (dry, ready to cart)	46·0
4 "	13·7 " 12·0 " 15·0 " "	54·8
*18 "	14·0 " 12·0 " 18·0 " (green) .	252·0
12 "	12·0 " 10·0 " 13·0 " (stacking) .	144·0
16 "	10·3 " 9·0 " 12·0 " (green) ..	61·8
16 "	13·0 " 10·0 " 18·0 " "	78·0
4 "	11·0 " 10·0 " 12·0 " (stacking) ..	44·0
5 "	12·5 " 12·0 " 13·0 " "	62·5
90		1,064·6

Average 11·8 lb.

* Cut by one machine, and weighed green; a slight wind was blowing, hence the result is rather higher than real weight.

† Two machines on the same day cutting side by side on same spot.

TABLE II.—Weight of Sheaves. (Barley.)

11 averaged	9·35 lb. from 7·0 to 12·0 (cutting, i.e. green) .	102·8
3 "	9·0 " 6·0 " 11·0 " "	27·0
6 "	8·5 " 7·0 " 10·0 (pitching and stacking) ..	51·0
4 "	9·7 " 9·0 " 10·0 (stacking) ...	38·8
4 "	6·3 " 6·0 " 7·0 (pitching) ..	25·2
6 "	6·5 " 5·0 " 8·0 (stacking) ...	39·0
34		283·8

Average 8·3 lb.

It will be seen in the case of the wheat that whereas 11·8 lb. is the average, the sheaves varied from 8 to 18 lb. for the individual sheaf, and from 9·1 to 14·0 lb. for the varying groups of sheaves. It so happens that in the case of both of these extremes the sheaves were in much the same condition, viz., ready for stacking. This variation in weight is not so trifling a matter as may appear at first sight to be the case, for as far as I could judge men work as fast with 12 lb.

sheaves as they do with those weighing only 10 lb. If this is so it follows that over three tons is lost in a day of 10 hours, taking 120 sheaves as the average number forming a cart-load, and three loads an hour.

With barley, the difficulty of loading, unloading, and building in the stack owing to the tangled nature of the sheaf, makes the loss of time even greater than it is in the case of wheat. Unfortunately, I was unable to get enough data to suggest what is an ideal weight of sheaf, but it is well worth the attention of both farmer and implement maker.

Cutting and Binding.—The method of obtaining information as regards this operation was as follows:—The machine was followed for a certain time, never for less than half and for sometimes over an hour; the sheaves were counted as they fell when following the machine. Subsequently the distance travelled was ascertained by carefully measuring the distance apart of sheaves. The width of track was then measured. By thus ascertaining the distance the machine had travelled and the width of track, it was possible to calculate what acreage had been cut in a given time. The following table gives the detailed account of operations reduced to acres and hours' work.

TABLE III.

No. of Horses.	Crop and its Condition.	Width of Track.	Rate of Travelling per Hour.*	Weight of Green Sheaf.	Acreage Cut per Hour.
3	Chevalier Barley. Heavy, slightly moist, and very dirty.	Feet, 5'33 cut Nominal 6'	Miles. 2'2	Lb. 9'35	1'4
3	Heavy crop of badly laid Barley.	5'34 cut Nominal 6'	2'1	9'0	1'36
3	Heavy crop Rivett Wheat, dirty with vine-weed.	4'6	1'8†	11'5	1'0
3	Light Oats, very dirty	5'5	2'1	13'5	1'4
3	? ‡	5'25	1'67	?	1'0

* Including stoppages in all cases, and on one occasion including delay to change a broken knife.

† Horses had already worked 10 hours.

‡ Crop not recorded, taken for pace, as horses seemed tired.

We have in this table five examples of cutting under several conditions of crop. In all cases, however, on this farm the same three horses worked, weather permitting, the whole day of 10 hours through. Taking the average of the five examples, we get 1·22 acres cut per hour, or 12 acres per day by three horses. This is a widely varying result from the estimated one that it takes two shifts of three horses or six in all with a heavy crop, or two shifts of two horses or four in all with a light crop to do the same amount.* It is but fair to point out that this makes no allowance for delays caused by the weather. Hence 10 acres a day might be considered a fair return from cutting ten consecutive days in the harvesting of 100 acres of straw in the average run of years. There was also another consideration: the horses in this instance were very much reduced in condition after this particular harvest. It will be remembered that the weather during the harvest of 1905 was particularly fine, so that the horses were kept going practically every working day of the four weeks of the month. This excessive working is not economical in my opinion, as the horses had to draw the machine $1\frac{1}{2}$ miles for each acre cut, or 18 miles in the day. This is too much; but, on the other hand, to supply a double shift and reduce the distance travelled to nine miles seems to me equally extravagant. There might, with advantage, be one rest horse with three workers, so as to reduce the distance travelled per day for each animal to under 14 miles.

Another point that struck me very forcibly was the inadvisability of having two machines working abreast. It is evident that with this system the number of stops is added to by practically 50 per cent., that is to say, each time the leading machine pulls up the machine following has to do the same. A case in point occurred towards the end of harvest, when I observed two machines which were travelling at a very rapid pace. It was a level field and early in the day, the corn, though heavy, was particularly dry and clean, standing well up, there being hardly a yard "laid" on the whole 12 acres. Though the machines went so fast that I had difficulty in keeping pace with them while they were

* Royal Agricultural Society's Journal, 1906, "Comparative Economy of different methods of harvesting."

moving, stops were so frequent that the result of 15 minutes' work was little better than the average of work done by single machines with all adverse conditions thrown in.

As a matter of fact these two machines, with six horses, cutting a track 11 feet wide, and travelling at the rate of 2·1 miles per hour, only cut 1·4 acres per hour, or about the same as the machines given in Table III.

Number of Sheaves to a Load.—This is a matter which has, as far as I know, never been tested, though it cannot be without some practical importance. If too small a number of sheaves are loaded, time is lost and horses are apt to be over-worked by an unnecessary number of journeys. If, on the other hand, carts are overloaded, horses are liable to strain and even injury, particularly if the road home to the rick-yard is not level, to say nothing of the great delay which may be caused at any moment by a spill. The following figures give the variations in the loads:—

TABLE IV.—No. of Sheaves per Load. (Wheat.)

Number of Loads counted.	Average number of Sheaves to each Load.	Weight of Load.
4	154	1,600
4	156	1,800
1	164	Not ascertained.
2	200	"
3	177	1,600
7	87	957
3	112	1,230
2	108	Not ascertained.

TABLE V.—No. of Sheaves to Load. (Barley.)

Number of Loads counted.	Average number of Sheaves to each Load.	Weight of Load.
2	150*	1,425
3	124	1,216
2	108	864
3	79†	770
2	96	Not ascertained.
2	122	768
2	200	Not ascertained.
3	142	923
4	196	1,271

* Roped.

† Very loose and badly tied crop; much laid.

An average taken from Table IV. would be deceptive, as the proportion of very small loads does not probably represent average conditions. Some of the larger loads did undoubtedly overstrain the horses. One horse that was working in the field when the largest loads were counted, viz., those of 200 sheaves, afterwards became very lame, and had to be laid up with a strained sinew. I should estimate about 15 cwt. to be a good load, which would represent 140 sheaves weighing 12 lb. Taking the following statement to represent an average acre of wheat under conditions of high farming, we can say that rather less than four loads, or, to be exact, 3·73 loads, would have to be carried in harvesting an acre of wheat.

Grain, 5 qrs. at 504 lb. ... ..	..	..	= 22 cwt.
Straw ... .. .. ..	..	..	= 30 "
Weed, etc.... .. .. ..	..	..	4 "
			—
			56 "

Pitching and Loading in Field.—Another point investigated was the time taken to pitch sheaves and to load on the carts when carting the corn from field to stack. The following table shows data taken:—

TABLE VI.—Pitching and Loading in Field.

Number of Men.		Time taken. Loads per Minute, including all Delays.	Number of Sheaves to the Load.	Crop.
Pitching.	Loading.			
1	1	2 in 35	200	Wheat.
2	2	3 in 27	171	"
1	1	1 in 9	Not ascertained.	"
2	2	3 in 23	112	"
2	2	3 in 23	150	Barley.
1	1	3 in 52	200	"
2	2	3 in 29	Not ascertained.	"
2	2	3 in 38	"	"
1	1	3 in 60	"	"
2	2	4 in 28	142	Oats.
AVERAGE.				
1	1	1 in 17·3	—	All crops.
2	2	1 in 8·8	1	"

It is very difficult to count the sheaves as pitched or loaded,

as with small binder sheaves a forkful may be two or three sheaves. The only way to obtain the correct figure is to have an assistant at the stack who counts the sheaves as they come off the load, or better, as they fall off the end of the elevator, only in this latter case care has to be taken to ensure that each load is kept separate. This is best done by making the horse walk on till the elevator is empty, without allowing the machine to stop full of sheaves, which may get counted into the next load.

Where two men pitch and two men load on to the same cart the advantages of the latter vehicle over the wagon as a harvest implement are to a certain extent lost. Man for man, more time is taken with pairs of men working together than where there is the one man pitching and one loading. The following figures giving the result of three separate trials bring out the point clearly. The loads were timed as far as possible when working together, and always when on the same part of the field.

Number of Men.

$$\begin{array}{lll} 1 + 1 & 7 \text{ loads in } 121 \text{ minutes} = 1 \text{ in } 17\cdot4 \text{ minutes.} \\ 2 + 2 & 9 \text{ ,, in } 90 \text{ ,, } = 1 \text{ in } 10\cdot0 \text{ ,,} \end{array}$$

or a loss of time to the men working in pairs of 2·6 minutes in 20, or 13 per cent. of the whole time. I am unable for reasons given above to state accurate figures as regards the number of sheaves to the load, but, as counted, the single pitchers and loaders put up a bigger load, and this was our experience all through the harvest. When one is watching operations the reasons for this loss of time become obvious. To begin with, the men gossip more, again they get in one another's way; finally, all delays, either accidental or arising through moving a cart from shock to shock or from row to row, are multiplied by two.

The Use of the Elevator in Stack Building.—In the use of the elevator much seems to be wanted in the way of systematising work. Farmers do not fully realise that this piece of machinery, though properly called "labour saving," may become expensive if not used with skill. The following table shows the result of some stacking operations (the first four refer to wheat and the remainder to barley):—

TABLE VII.—Stacking Corn with Elevator. (One Horse.)

Number of Men unloading.		Number of Sheaves to Load.	Loads per Hour.	Weight of Crop per Load.	Weight of Crop per Hour.
On cart.	On stack.				
2	5	154	9	1,600	14,400
2	5	156	10	1,794	17,940
1	4	85	8·5	Small loads, weight not ascertained.	
2	6	112	9·3	1,232	11,457
1	4	79	9	770*	6,930
1	4	100	11	970	10,670
2	5	196	7·2	1,271	9,151
2	4	142	10·9	923	10,069
Average 1·6	4·6	128	9·3	1,222	11,515

* Sheaves very badly tangled, hence very light.

It will be seen from the above table that frequently two men were employed unloading from the cart on to the elevator. By comparing the various operations in the above table there would seem to be no reason at all for employing two men to unload. The following tables show the actual time taken in the operation of unloading at the stack:—

TABLE VIII.—Unloading Sheaves on to the Elevator.

Crop.	Actual Time taken for each Load.	Number and Weight of Sheaves to Load.	Possible Weight per Hour.
TWO MEN.			
Wheat	3 minutes	158 × 10·5	30,020 lb.
,"	3 "	147 × 11·5	33,810 ,,
,"	3 "	156 × 11·5	35,800 ,,
,"	3 "	157 × 11·5	36,110 ,,
Average	3 ,,	154·5	33,955 ,,
ONE MAN.			
Wheat	5 minutes	133 × 10·5	16,758 lb.
,"	4 "	80 × 11·5	13,800 ,,
,"	5 "	161 × 9·5	18,354 ,,
Barley	4 "	103 × 9·7	14,986 ,,
,"	3 "	95 × 9·7	18,430 ,,
Average	4·2		16,465 ,,

It will be seen that the average work of two men is 33,955 lb. per hour, while the amount of work one man might do if working the whole time is 16,465 lb. This last figure is much higher than the one shown for stacking with the elevator. It will be seen that in Table VII. the average amount unloaded by 1·6 men was 11,515 lb., whereas, according to the above figures, the same amount might have been done by one man with nearly 30 per cent. of his time to spare for changing carts, &c., which, with systematic management, should be ample. In the case of two men unloading we have the possibility of doing 33,955 lb. of work, which leaves over 70 per cent. as surplus time. This amount was over and over again noticed to be excessive in practice. If the number of sheaves unloaded in an hour's work in Table VIII. is examined, it will be seen that in one case the maximum (161 sheaves) was unloaded in five minutes, or a possible total of 3,220 sheaves in an hour, whereas in Table VII. it will be noticed that in practice the greatest number that ever were unloaded was 1,560. I have not figures sufficiently comprehensive to deal thoroughly with the number of hands required on the stack for building, but from much observation I am convinced that four men on the stack are amply sufficient, for in no one case where this number was employed was delay caused by the men on the carts having to wait to unload till the builders had finished their work. In order to compare the elevator work with other stack building carried on in the immediate neighbourhood where this implement was not in use, the records given in Table IX. were obtained. It is not suggested that the results are conclusive, but they are sufficiently striking to give rise to reflection on the part of any who may be inclined to be careless in the use of the elevator.

Here, though admittedly with a limited amount of data, we show that one man on the cart unloading, three men stack building, and without the expense of a horse and elevator, 6·2 loads are dealt with per hour, whereas in Table VII. we find that with 1·6 men unloading, 4·6 on the stack, plus one horse for the elevator, and with the expense of an elevator thrown in, only 9·3 loads are dealt with. Many may doubt the possibility of such figures. They are undoubtedly very

TABLE IX.—Stack Building without Elevator.

Number of Men.		Number of Loads per Hour.	Crop.	Weight per Load.	Weight per Hour.
Unloading.	On stack.				
1	3 4*	12·0	Wheat ...	l.b. 957	l.b. 1,148†
1	3	4·5	Oats ...	Large loads	Not ascertained.‡
1	2	2·1	Barley ...	179 sheaves	Not ascertained.§
Average 1	3	6·2		?	

* 3 during part of time.

† From commencement to half way up the stack.

‡ Top of stack.

§ Finishing off at top of stack.

striking, though possibly not of general application, inasmuch as there are not sufficient of them to constitute a reliable average. Still, such as they are, they were timed and measured under circumstances as far as possible consistent with a fair trial.

A further point that the last table brings out is that the great value of the elevator lies in its employment when finishing the stack. Though this is a circumstance that may reasonably be considered obvious to anyone, it is nevertheless frequently overlooked. Men will set up and use the elevator almost from the commencement of the rick, or at any rate when it is only three feet or so above ground level. This is bad practice, in that it not only gives unnecessary work to a horse, and that at a time when every moment's rest is of importance, but it is liable to create great waste, for, owing to the distance which sheaves have to fall when the stack is only just above ground level, a lot of unnecessary knocking out of corn takes place. If those who are interested will but examine the stack bottoms after the thrashing machine they will find that the abuse of the elevator in this manner leads to a very large amount of spilt or spoilt grain.

We are now able to summarise matters concerning carrying and stacking as follows. Each pair of men, *i.e.*, one pitching and one loading, will be able to dispatch to the rickyard 3·4 loads in every hour's work. In the process of stacking, one man on the cart, one horse at the elevator, four men build-

ing, or in all five men and one horse, will be able to deal with from ten to eleven loads without difficulty in an hour, for it is seen in Table VIII. that the average time one man took to unload a cart on to the elevator was 4·2 minutes, so that granting that he does 11 loads per hour, he will still have a margin of nearly a quarter of an hour, or over one minute for each load, to change carts, &c. In stack building itself four men will not find this amount of material passing over the elevator more than they can deal with. Hence such a team in the rickyard will keep three pairs of men employed loading in the field, so that they may receive 10 loads for each of the 10 hours' work which constitutes a full harvest day.

The Number of Horses required for Carting.—The figures I have bearing on the question of how many horses are wanted to carry from field to rickyard show that five horses can cart 10 loads per hour. This is the average of some half-dozen different operations, and is for distances varying from one-third to one-half a mile. It includes, as unfortunately is often the case, a great deal of waste, due largely to the vagaries of boys; on two occasions this waste was timed and was found to represent some 15 per cent. of their whole working time. For on the farms in question, as is so often the case, once the carts were loaded, they were handed over to the care of boys who led them to the rickyard. The employment of these youthful enthusiasts seemed to be of doubtful economy. On some farms the man who loads in the field goes straight on with the cart, unloads at the stack, and returns with the same vehicle to the field. When one realises the number of people who may be kept waiting doing nothing if a boy while in charge of a horse takes it into his head to play about, it may, notwithstanding the extra cost in wages, be cheaper in the long run to employ the man. There is also the fact that the man who is on the cart under this system gets off and on less frequently than he does when the boy labour intervenes. We have said nothing about the many extra chances of accidents arising through the carelessness of boys, but all who have had to superintend a harvest will realise that this is often no small matter.

Stooking or Shocking.--Unfortunately I was unable to get any data worth recording concerning this operation.

Attempts were made to do so, but it proved difficult owing to the very fine harvest. Under these circumstances stooking is less important, and done more at odd times, rendering it very difficult to ascertain the acreage covered.

Cost of Harvesting.—We are now able to estimate from what actually took place something about the cost of harvesting. When estimating, it is usual to fix on some arbitrary price per day as representing the cost of each horse, and in the same way the wages per man per diem is assumed. I think it better to leave out the monetary item, and to estimate in terms of days' work only, then anyone having these figures before him can put his own price for horse or man.

Cutting with Binder.—The data already given in Table III. give most of the information required on this point, the only addition being for the man described as "cutting corners." It was noticed on many occasions that one man so occupied kept two machines going at the same time, and this is obviously one of the advantages of two machines being set to work side by side. When, however, machines are working near to one another, one man is equally able to keep the corners mown, help to put in and keep the new knives sharp, and, if necessary, take a turn at driving the binder. But it must not be forgotten that over and above all this, the extra man has to open up the field before the machine appears on the scene, so that in allowing an extra man to each machine at work, we are not over-estimating the manual labour employed. The amount of work done by the horses was, in my opinion, excessive, but the figures show as far as possible what actually took place. Ten hours was the time occupied in working per day, after deducting all delays for meals, light refreshments, &c., on the farms in question. The figures show that one man cutting corners, and one man driving a binder, with three horses, cut 12·3 acres per day of 10 hours, or 0·17 men and 0·24 horses per acre.

Carting and Stacking.—The amount of carting and stacking per day of 10 hours may be estimated as follows. It will be seen in Table VII. each load represents 10 cwt., made up of four examples of wheat and four examples of barley carting. Fortunately on these farms a more or less accurate account of both weight of straw and weight of corn produced

per acre has been kept for very many years. Taking the mean weight of wheat and barley, the record shows that for corn plus straw (*i.e.*, everything that is not cavings or weed) the weight produced per acre averaged 39·5 cwt. Assuming that cavings and rubbish amount to 5·5 cwt., the yield of each acre may be estimated to represent a gross product weighing 45 cwt. The number of acres in the following table is calculated therefore on the assumption that each load averaged 10 cwt. and each acre yielded 45 cwt., so that if the men dealt with 9·3 loads per hour, or 93 loads in a day, this would represent the produce of 20·7 acres.

TABLE X.—Cost of Carting and Stacking Expressed in Terms of Days' Work for Man and Horse.

		Men.	Horses.
Men in field—Pitching .	.	2·7	
Loading .		2·7	—
Men at stack—Unloading ..	..	1·6	—
Building .		4·6	—
Horses—Carting ..	..	—	4·6
On elevator ..	..	—	10
Total ..	..	<u>11·6</u>	<u>5·6</u>
Per acre (at 20·7 acres per day) ..	..	<u>0·56</u>	<u>0·27</u>

Summary.—The labour, horse and manual, required in a fine harvest in harvesting an acre of corn, half of which is wheat, half barley, where the elevator and binder is used, is therefore as follows, though it must be remembered stooking is not included, and that the cost of this operation in bad weather may be a very considerable item:—

Men and Horses required per Acre per Day.

		Men.	Horses.
Cutting and binding ..	..	0·17	0·24
Cutting and stacking ..	..	0·56	0·27
Total... ..	..	<u>0·73</u>	<u>0·51</u>

Or, to put it in another form, about 14 men and 10 horses would be required to harvest 20 acres in one day. As regards the actual cost of harvesting to the farmer, many items have to be added before any definite statement can be made, string, wear and tear of implements, thatching, &c., being the main extras. It is hoped, however, that the data here published may make the calculations of cost of production in the future somewhat more certain than they have been in the past.

IMPORTS OF AGRICULTURAL PRODUCE IN 1908.

The total value of the principal articles of food imported into the United Kingdom in 1908 was £183,699,000 as against £188,353,000 in 1907, £181,604,000 in 1906, and an average of £177,047,000 in the three years 1903-1905. These figures represent the value (cost, insurance, and freight), as declared to the Customs officers at the port of arrival, of the grain and flour, meat and animals for food, butter, cheese, eggs, fruit and vegetables, hops, lard, and margarine, which may be grouped together as agricultural food products in the sense that they compete more or less directly with the home supply.

It is a somewhat interesting fact that the increase in value during recent years has been due almost entirely to a rise in price and not to any substantial growth as regards the principal articles in the quantities of food imported. Without attempting any precise analysis, it may be said broadly that on the average of the two years 1907-1908 the imports of cattle, sheep, flour, barley, oats, maize, cheese, margarine, and eggs were less than they were for the two years 1903-4, while the imports of wheat, bacon, hams, butter, and lard show little or no advance, and it is only in the purchases of fresh beef and mutton that any extension is distinctly perceptible. The fluctuations in some of these items from year to year are considerable, but it may fairly be said that during the past four or five years the rise in the import of some of the principal articles of food has been checked, and that though the trade has been more or less maintained, it has shown no tendency to increase.

Cattle and Beef.—The importation of live cattle for food which fell off in 1907 experienced a further decline in 1908. To some slight extent this was due to the prohibition of animals from certain United States ports consequent on the outbreak of foot-and-mouth disease in that country, but the bulk of the decline occurred in the first ten months of the year before the prohibition came into force. It was practically confined to the United States, as the receipts from Canada were about equal to those of 1907. The important

character of this change in the trade may be judged from the fact that the value of imported cattle in the past year was only £6,549,000 as against £9,732,000 in 1906.

The decrease in the imports of cattle from the United States was accompanied by a marked falling off in the receipts of fresh beef from the same country, so that the supplies of the better qualities of imported beef, viz., port-killed and chilled American, were decidedly small. To some extent this was compensated for by a great extension in the shipments from Argentina, which now in point of quantity holds the premier position in the beef trade. During the past year Argentina sent no less than 3,590,000 cwt. as against 2,692,000 cwt. in 1907, while the contribution of the United States was only 1,432,000 cwt. as against 2,417,000 cwt. in the previous year. The difference in quality may be judged by the fact that the average value of the River Plate beef was 34s. per cwt., while that sent from the United States is returned at 45s. 8d. per cwt. These figures were two to three shillings higher than those of the previous year.

The imports of fresh beef amounted in all to 5,632,000 cwt., while the weight of beef represented by the imports of cattle may be estimated at 2,483,000 cwt., so that the total receipts of meat of this class from abroad in 1908 were 8,115,000 cwt., or about 20 $\frac{2}{3}$ lb. per head of the population. In 1907 the figures were 8,806,000 cwt., representing 22 $\frac{1}{3}$ lb. per head, and in 1906 9,170,000 cwt., equal to 23 $\frac{1}{2}$ lb. per head.

Sheep and Mutton.—The remarkable diminution in the imports of live sheep, which has been noticeable in the past three years, was more than maintained, and the total sank to a lower figure than in any year since 1893. In 1904 the number received was 382,000, almost entirely from the United States and Canada, whereas in the past year it was only 78,900. A slight decline also occurred in the fresh mutton trade, the receipts both from New Zealand and Australia being less.

The imports of fresh mutton amounted to 4,391,000 cwt., while the weight of meat represented by the sheep received alive may be estimated at 43,100 cwt., so that the total receipts of fresh mutton from abroad in 1908 was 4,434,000 cwt., or about 11 lb. per head of the population. In the

previous year the figures were 4,649,500 cwt., or about 11 $\frac{1}{3}$ lb. per head of the population.

IMPORTS of Live and Dead Meat.

Description.	Quantity.		Value.	
	1907.	1908.	1907.	1908.
Cattle	Number. 472,015 105,601	Number. 383,130 78,900	£ 8,105,109 168,531	£ 6,549,285 122,525
Sheep				
Swine				
Total live animals ...	—	—	8,273,640	6,671,810
Beef, fresh	Cwt. 5,735,003	Cwt. 5,631,989	10,397,102	10,308,380
,, salted	138,347	114,742	201,222	215,220
Mutton, fresh	4,578,523	4,391,259	8,687,407	8,148,457
Pork, fresh	567,332	572,222	1,338,242	1,331,435
,, salted	254,037	270,628	328,369	328,851
Bacon	5,305,605	5,685,742	14,839,201	14,480,579
Hams	1,132,649	1,225,227	3,242,183	3,084,669
Meat unenumerated—				
Fresh	604,894	697,817	1,041,487	1,188,934
Salted	58,060	74,018	87,780	107,977
Meat, preserved	316,505	464,668	1,534,912	1,883,481
Rabbits, dead	692,923	550,928	862,735	685,448
Total dead meat ..	19,444,478	19,679,240	42,560,640	41,763,430
Poultry and game ..	—	—	1,053,933	1,053,299

Bacon.—The imports of bacon, which had been checked in 1907, rose again in 1908, and reached a higher total than in any year since 1901. The principal sources of supply were United States (2,542,000 cwt.), Denmark (2,051,000 cwt.), and Canada (1,004,000 cwt.). The figures for Denmark were the highest yet recorded, while those for Canada were rather lower than for several years past. The declared value, viz., 50s. 11d. per cwt., was 4s. 5d. less than in 1907, but even this figure is 42 per cent. higher than it was in 1899, when the average value of imported bacon was only 35s. 10d. per cwt.

Poultry and Game.—Poultry is chiefly received from Russia, the United States, Belgium, and France, and game from these and other countries. The total value of the poultry received was £935,000 compared with £904,000 in 1907. Russia's share in this trade amounted to £354,000, that of the United States to £154,000, and that of Belgium and France to £192,000 and £199,000 respectively.

Total Imports of Meat.—Converting the live animals into their equivalent weight of meat and adding the total imports of dead meat of all kinds (excluding poultry and game), it appears that this country consumed, in addition to the home supply, some 22,205,000 cwt. compared with 22,586,600 cwt. in 1907. The total value credited to the different kinds of live and dead meat, including poultry, was £49,489,000 as compared with £51,888,000 in 1907 and £52,026,000 in 1906.

IMPORTS of Dairy Produce, Margarine, and Eggs.

Description.	Quantity.		Value.	
	1907.	1908.	1907.	1908.
Butter	Cwt.	Cwt.	£	£
Butter	4,210,156	4,211,195	22,417,926	24,082,537
Margarine	885,068	813,447	2,223,645	2,081,240
Cheese	2,372,233	2,306,086	6,905,509	6,684,203
Milk, condensed ...	911,771	921,019	1,599,405	1,607,524
Eggs	Great hundreds.	Great hundreds.	£	£
Eggs	18,567,901	18,210,070	7,135,530	7,183,112

Butter.—Of all the imported foodstuffs, butter accounts for a larger sum of money than any other single item, except wheat, and the declared value of the supply of this product as it reached our shores in 1908 amounted to £24,083,000. Denmark is by far the largest exporter to this country, and furnished 1,857,000 cwt., which was slightly above the figure for 1907. Russia was the next largest exporting country, and supplied 639,000 cwt. The Colonies of Victoria, New South Wales, Queensland, and New Zealand sent only 621,000 cwt. as against 901,800 cwt. in 1907 and 857,500 cwt. in 1906, while the amount credited to Canada was unimportant compared with some previous years. Perhaps the most noticeable feature was the substantial advance made by Holland and France, the former country sending 244,000 cwt. as against 168,000 cwt. in 1907, and the latter 395,000 cwt. compared with 281,000 cwt. in the earlier year. The average value of the imported butter was 114s. 4d. per cwt. compared with 106s. 6d. in 1907, and this is a higher figure than any previously recorded.

Cheese.—Imported cheese comes very largely from Canada, that country supplying 1,542,000 cwt. out of a total of 2,306,000 cwt., or nearly two-thirds. New Zealand, however, is beginning to secure a position in this trade, the imports having grown from 56,339 cwt. in 1903, to 265,000 cwt. in 1908.

Eggs.—No very great change took place in the egg trade, the total imports being 18,210,000 great hundreds compared with 18,568,000 great hundreds in 1907. Russia is the principal source of supply, and furnished 7,062,000 great hundreds, while Denmark and Germany accounted for 3,916,000 and 2,370,000 great hundreds respectively. The average value of eggs from all countries was 7s. 10 $\frac{3}{4}$ d. per 120 as against 7s. 8 $\frac{1}{4}$ d. in 1906.

Margarine.—Margarine is imported chiefly from the Netherlands, 765,000 cwt. out of a total of 813,000 cwt. being received from that country. The receipts, however, are less than in 1906, when they amounted to 1,102,000 cwt.

IMPORTS of Grain and Flour.

Description.	Quantity.		Value.	
	1907.	1908.	1907.	1908.
Wheat	Cwt. 97,168,000	Cwt. 91,132,705	£ 37,346,548	£ 38,295,940
" meal and flour ..	13,297,366	12,969,855	6,694,182	7,075,231
Barley	19,627,620	18,137,200	6,564,670	6,113,945
Oats	10,485,290	14,271,150	3,383,553	4,162,775
Oatmeal	638,702	500,698	479,352	416,134
Maize	53,379,950	33,841,000	14,604,504	10,388,061
" meal	658,654	45,410	213,581	159,484
Peas	1,245,670	1,060,999	602,648	538,315
Beans	799,569	1,043,997	290,693	373,018
Other corn and meal ..	1,588,958	1,618,181	644,591	682,289
Total	—	—	70,824,222	68,205,192

Grain and Meal.—The imports of grain and meal during the cereal year ending 31st August, 1908, were dealt with in this *Journal* in September last. The table above shows the receipts during the calendar year, and it may be noted that the imports of wheat exceeded in value those of any previous twelve months, though the quantity was materially less than in several recent years. The leading sources of supply were

Argentina (31,680,000 cwt.), United States (27,123,000 cwt.), Canada (14,442,000 cwt.), Russia (4,610,000 cwt.), and Australia (5,518,000 cwt.). India, which is usually a leading exporter, sent less than 3,000,000 cwt. The receipts of flour from the United States were maintained at nearly the same level as in the two preceding years, 9,781,000 cwt. coming from this source compared with 9,325,000 cwt. in 1907 and 9,809,000 cwt. in 1906.

The average value of wheat was nearly 8s. 5d. per cwt., or 9d. higher than in 1907, and 1s. 5d. above the value of 1906.

The importation of barley was somewhat less than in 1907, and stood at a lower figure than in any year since 1900. The principal contributors were Russia (8,416,000 cwt.), Turkey (2,733,000 cwt.), Roumania (1,566,000 cwt.), and the United States (1,865,000 cwt.).

Oats amounting to 14,271,000 cwt. were imported in 1908 as against 10,485,000 cwt. in 1907. Russia (3,799,000 cwt.) and Germany (3,991,000 cwt.) were the two chief sources of supply, practically nothing coming from the United States, which in some years figure in the returns to a substantial extent. A noticeable feature was the large import from "Other countries" (unspecified), which amounted to 5,950,000 cwt. A considerable portion of this came from Argentina, which has recently assumed a position of importance in this trade.

The supply of maize (33,841,000 cwt.), on the other hand, was decidedly small, and it is necessary to go back as far as 1893 to find a year in which the importation fell as low as it did in 1908. Argentina was the only country which maintained its exports, Russia, Roumania, the United States, and Canada all furnishing diminished quantities.

The total value of the grain and meal of all kinds imported was £72,735,000 as compared with £75,409,000 in 1907.

Fruit and Vegetables.—The imports of fruit and vegetables call for little remark. Potatoes were received in smaller quantities than in the previous year, but the total was still considerable. France sent 3,147,000 cwt. as compared with 2,997,000 cwt. in 1907, while the Channel Islands supplied less (1,207,000 cwt. as against 1,947,000 cwt.). The receipts of tomatoes showed little variation.

The supply of imported hops (280,000 cwt.) was larger than in any previous year except 1904, when 314,000 cwt. were received. About two-thirds came from the United States.

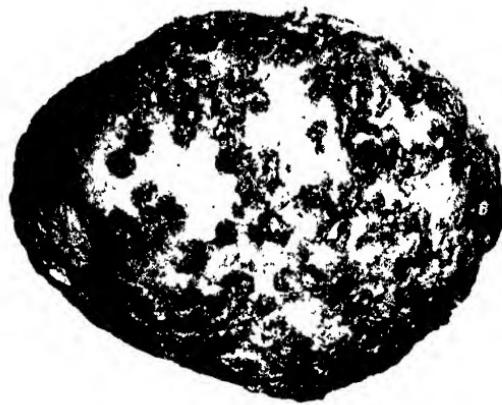
Wool.—As regards wool, the importation, though still large, was not quite equal to that of the previous year. Prices dropped, and the average value, which had stood at about 10*1*d. per lb. in 1906 and 1907, fell to 9*1*d. per lb., which was about the level in 1905. The bulk of the supply comes from our own Colonies and Possessions, viz., Australia (321,055,000 lb.), New Zealand (159,699,000 lb.), South Africa (80,570,000 lb.), and India (34,372,000 lb.).

The quantities received from Australasia were almost exactly identical with those of last year, while there was some falling-off from South Africa and India.

The re-exports of foreign wool were a little larger, amounting to 325,451,000 lb. as against 312,673,000 lb. in 1907, so that the balance of foreign wool remaining for manufacture in this country was less, viz., 393,625,000 lb. as compared with 446,563,000 lb. last year.

Some indication of the range of prices in 1908 as compared with the two preceding years may be gathered from the average declared value of the different articles. Cattle, sheep, mutton, pork, bacon, hams, cheese, oats, and wool all show a fall. The figures for some of the principal articles are as follows:—

Description.		1906.	1907.	1908.
Cattle ...	Head	£ 17 s. 6 d. 10	£ 17 s. 3 d. 5	£ 17 s. 1 d. 11
Sheep ...	"	1 10 4	1 11 11	1 11 1
Beef, fresh ...	Cwt.	1 15 5	1 16 3	1 16 7
Mutton, fresh ...	"	1 17 5	1 17 11	1 17 1
Pork, fresh ...	"	2 5 11	2 7 2	2 6 6
Bacon ...	"	2 12 6	2 15 4	2 10 11
Hams ...	"	2 13 7	2 17 3	2 10 4
Butter ...	"	5 8 2	5 6 6	5 14 4
Cheese ...	"	2 17 8	2 18 3	2 18 0
Eggs ...	Great hundred	0 7 6 <i>1</i> ²	0 7 8 <i>1</i> ²	7 10 <i>1</i> ²
Wool ...	Lb.	0 0 10 <i>1</i> ²	0 0 10 <i>1</i> ²	9 <i>1</i> ²
Wheat... " flour	Cwt.	0 7 0	0 7 8	8 4 <i>1</i> ²
Barley ...	"	0 9 7	0 10 1	10 11
Oats ...	"	0 5 8	0 6 8	6 9 <i>1</i> ²
Maize ...	"	0 5 11	0 6 5	5 10
		0 4 11	0 5 6	6 1 <i>1</i> ²



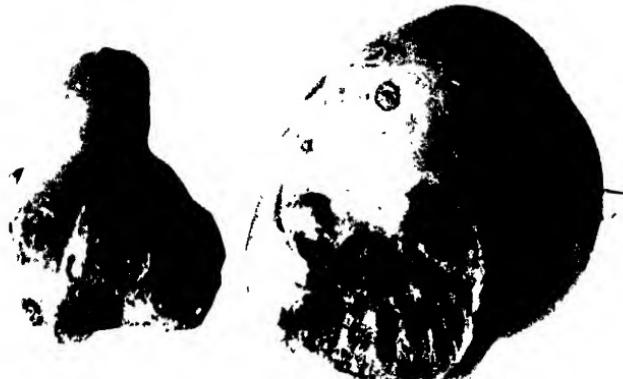
SCAB PRODUCED BY MECHANICAL AGENCY.



SCAB DUE TO *Oosporea Scabies*, THAX.



SCAR AND HOLES MADE BY *Julius Pulellus*, L.



SCAB DUE TO *Spongospora Scabies*, MASS.

VARIETIES OF SCAB IN POTATOES.

Scab due to Mechanical Injury.--This type of scab is recognised by the very superficial nature of the scars, which often cover the greater portion of the surface of the tuber, and are entirely due to mechanical irritation of the skin of the potato during the early stage of growth. The most general cause of irritation is the presence of ashes in the soil, consequently it is very prevalent in the neighbourhood of towns, where night-soil is used as a manure. In an experiment conducted at Kew, for the purpose of proving the correctness of the above statement, twelve potatoes free from scab of any kind were planted in soil mixed with ashes. A second row parallel with the first, planted in soil containing no ashes, acted as a control. When the crop was lifted, all the potatoes grown in the land containing ashes were badly scabbed, whereas those grown in the land not containing ashes were free from scab. This experiment has been repeated on several occasions with similar results.

In addition to ashes, certain climatic conditions favour the formation of the scab under consideration. During a dry period the surface of the quickly-growing tubers presses against the comparatively unyielding soil, with the result that the skin is injured. As such injured tubers continue to increase in size, the original minute scars are stretched wider and wider, and become bounded by a somewhat raised border of wound-cork, the result being scab. This type of scab is often very prevalent on potatoes grown in sharp sandy soil during a dry season.

Unless complications follow, the injury caused is slight, as the wounds are only "skin deep," and such scabbed potatoes may be used for "sets." In many instances, however, mechanical injuries to the skin enable eelworms, bacteria, fungi, &c., to gain an entrance into the tuber, which may result in its complete destruction.

*Wart Disease or Black Scab of Potatoes.**--This disease is recognised by the presence of one or more irregularly shaped, corrugated masses or warts projecting from the surface of the tuber. These warts are pale when young, but

* A memorandum on this disease appeared in the *Journal*, Dec., 1908.

gradually assume a blackish colour with age, due to the presence of myriads of dark-coloured spores belonging to the fungus causing the disease.

The young "sprouts" only are attacked by the fungus, the substance of the tuber at first remaining free from injury. When a sprout is attacked, the irritation set up by the fungus causes an excess of food material to enter the infected area, which rapidly increases in size and spreads over the surface of the tuber. In cases where several sprouts are attacked, the entire surface of the tuber often becomes covered with an irregular, cauliflower-like mass.

In some instances, when the haulm is lying on the ground, the young leaves are attacked and distorted by the fungus; very young tissue, in fact, of any portion of a potato plant appears to be liable to infection.

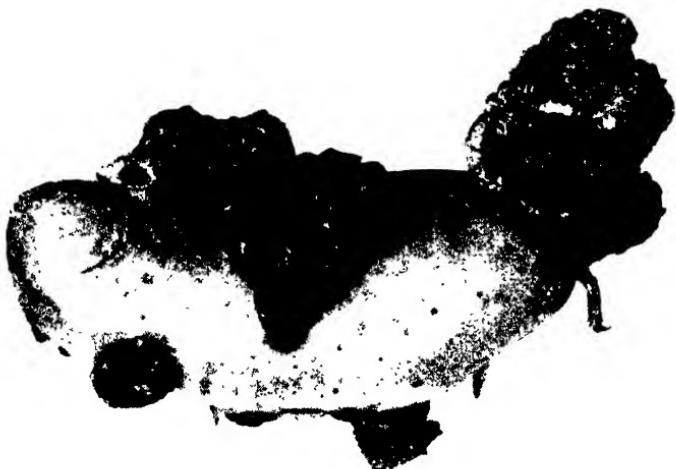
When the fungus spores are mature the warts commence to break up and decompose, thus liberating the spores, which pass into the soil. At this stage various kinds of fungi and bacteria gain an entrance into the tuber and complete its destruction.

After years of failure, the spores of the fungus causing black scab have at last been induced to germinate. This advance enables the systematic position of the fungus to be determined with certainty, and will also aid in formulating preventive measures, now that its life-history is known.

Scab caused by Millipedes.—Among the various kinds of millipedes, popularly known as "false wire-worms," *Julus pulchellus*, L., is the greatest enemy to growing potatoes. It varies from half to three-quarters of an inch in length, and is not much thicker than an ordinary pin, pinkish-white in colour, with two rows of small purple spots running its entire length. Although not generally a primary cause of injury, *Julus* readily takes advantage of any minute wound, which it quickly enlarges by feeding on the sound portion of the tuber. In some instances numerous shallow cavities are formed in the flesh of the potato, and as each wound becomes surrounded by a raised border of wound-cork, a scabbed appearance results. In other instances small holes roughly circular and of varying depth are produced, whereas in some cases, as when following on an attack of *Spongospora scabies*,



WARTY DISEASE OR BLACK SCAB OF POTATOES.



WARTY DISEASE OR BLACK SCAB" OF POTATOES

Mass., very large cavities are formed, or the tuber may be completely hollowed out. In such cavities hundreds of millipedes are often present. Millipedes are often introduced to the land in leaf mould or decaying vegetable matter. Lime is the best corrective.

Oospora Scab of Potatoes.—The scab produced by the fungus called *Oospora scabies*, Thaxter, superficially resembles that due to mechanical injury, but is distinguished by the presence of the parasite, which appears on the wounded portions as a delicate greyish bloom. The entire surface of the tuber is frequently broken up, or scabbed; in other examples the injured portions are more or less circular in outline, and scattered over the surface of the tuber.

Beet, swedes, turnips, and carrots are susceptible to this disease, and should not follow a crop of diseased potatoes, as the fungus remains alive in the soil for some years.

Nitrate of potash, at the rate of two hundredweight per acre, has proved beneficial.

Spongospora Scab of Potatoes.—This form of scab, due to the Myxogaster called *Spongospora scabies*, Mass., was described in detail in the *Journal*, November, 1908, p. 592. The accompanying figure illustrates the type of wound produced by this organism, when potatoes are growing in fairly damp soil. The certain proof that *Spongospora* is the cause of injury is the presence of the very characteristic spores, which form a snuff-coloured mass on the surface of the wound.

Judging from the very large amount of material received at Kew for examination, *Spongospora* scab is much more prevalent in Scotland than in England.

Cockroaches.—In connection with the note on cockroaches which appeared in the April, 1908, issue of this *Journal*,

p. 45, it may be added that an excellent method of combating these pests consists in fumigating with bisulphide of carbon. If infested rooms can be left unused for a day or two, saucers con-

**Notes on Insect,
Fungus and other
Pests.***

* Notes on insect, fungus, and other pests, dealing with the specimens submitted to the Board for identification, and their apparent prevalence, will appear in this *Journal* month by month. The notes commenced with the issue for June, 1907.

taining a little bisulphide of carbon may be placed here and there. The room should then be made as nearly air-tight as possible, and be kept closed for 24 to 48 hours, after which it should be ventilated for an hour or two before being used.

Black Currant Bud Mite.—A case of big bud on currants, caused by the bud mite *Eriophyes ribis*, was received early in November. The variety was "Black Naples," budded on "Boskoop Giant," and as that operation took place last July it is evident that the mite has appeared in a shoot which has grown since that time. This raises a point of considerable interest. It is possible that the mites entered the buds on the new shoots (1) from the "Boskoop Giant," as the migration period, although probably at its height about June, is really extended over a wide period, or (2) from the bud of the "Black Naples." In any case it is an example of one of the great difficulties in connection with the reappearance of the currant bud mite, which is that, although black currants may be cut right back, yet the mite may still appear in numbers. It is possible that there are temporary shelter places other than the buds. (See Leaflet No. 1.)

Chrysanthemum Rust.—*Chrysanthemum* leaves received from Limpsfield (Surrey) were found to be affected with the chrysanthemum rust *Puccinia chrysanthemi*, Roze., in considerable quantity. Diseased plants should be removed from the neighbourhood of healthy ones, and both diseased and healthy plants should be sprayed at intervals of five days with a solution of liver of sulphur in water—1 oz. to 3 gallons of water.

Diseased Apple Leaves.—Specimens of apple leaves were forwarded from Crewkerne, and were found to be attacked by the minute fungus, *Phyllosticta malii*, Prill. and Del. Recent experiments have shown that trees which were sprayed with Bordeaux mixture for the prevention of the "apple scab" remained perfectly free from the *Phyllosticta* spot.

Various Fungus Diseases.—Among other specimens affected with fungus diseases were tomato plants from Campden (Glos.), attacked by *Septoria lycopersici* (see *Journal*, May, 1908, p. 111). No method of destroying the resting-

spores of the fungus in the soil is known, but the sterilisation of the soil as described in Leaflet No. 75 is recommended.

Phoma grossulariae, Schulz., was present on gooseberry specimens from Faversham; and violet root rot (*Rhizoctonia violacea*), described in Leaflet No. 171, was found to be attacking a potato crop of which specimens were received from Cheadle.

Time of Spraying.—In connection with the use of sulphate of copper and caustic washes for spraying purposes, a correspondent asks if January is the best month to use sulphate of copper to be followed by a caustic wash in February. Solutions of sulphate of copper and of caustic soda kill, or at all events injure, leaf-buds that are commencing to swell, so that the character of the weather is of more importance than the actual time of the year as an indication of danger in applying these sprays. The leaf-buds of certain bushes will begin to move during a mild February, and under such conditions it would then be too late to spray, whereas in the event of hard weather there would be no danger.

The life history of the Humble Bees (genus *Bombus*) differs from that of the Hive or Honey Bee (*Apis mellifica*). When the weather becomes colder at the end of the year all the inmates of the nest of a Humble Bee die except the large queens, as, unlike the hive of a Honey Bee, where typically a single queen

**The Humble Bee
and the Pollination
of Red Clover.** only is tolerated, the nest of a Humble Bee may contain a number of queens. All the males or drones die, all the workers die, and small queens die, while the large queens seek some cosy place in which to pass the winter. In the next spring these queens issue from their hibernating places, and, each choosing a suitable place for a nest, acts as the foundress of a new colony. As soon as a suitable hole is found, the queen makes a nest, in which several eggs are laid. From these first-laid eggs workers in due course develop, and undertake the duties of the nest other than the maternal duties to which—now that workers are present—the queen limits

herself. More eggs are subsequently laid, and the nest and cells are added to during the summer as occasion requires, but the inmates of the nest consist of the queen and numerous workers only. The cells left empty as the workers issue from the cocoons are utilised as receptacles in which honey is stored, to serve as food for the young grubs during wet or unfavourable weather when the workers are detained inside. Later in the season males and females are reared as well as workers (which are neuters or abortive females), and eventually fertilisation of the females takes place, and the cycle described above is repeated.

Pollination of Red Clover.--An enquiry has been addressed to the Board with regard to the value of these insects for the purpose of fertilising red clover, and on this point it may be remarked that the honey in the red clover flower is secreted at the base of the stamens, and lies at the bottom of a tube 9 to 10 mm. long. In order to reach this honey by the usual means an insect must have a proboscis of the same length. The stamens which produce the pollen, and the stigma of the style which receives the pollen, are covered over by parts of the red clover flower, known as the keel or carina, while another portion of the red clover flower, known as the wings, is also concerned in the process.

The Humble Bee, on visiting a red clover flower, holds on to the petals (wings) with its forelegs, and these petals and the keel are pulled in such a way that the anthers of the stamens and the stigma protrude. As the style is taller than the stamens, the stigma first comes in contact with the bee's head and receives any pollen present on the underside of the head of the visiting bee. The stigma is thus cross-pollinated. The anthers of the stamens next strike the bee's head and dust their pollen on to the bee. The bee, dusted afresh with pollen, visits a second red clover flower, and the process is repeated. It is quite possible that as the bee leaves a red clover flower (before the keel closes again) the stigma may have some of the pollen from the stamens of the same flower dusted on it. This is called self-pollination. Darwin believed that in spite of this possible self-pollination in red clover there would be no consequent self-fertilisation, as the pollen from the preceding

cross would be potent to accomplish fertilisation. Kerner, however, believes self-fertilisation possible.

The varieties of Humble Bee having a proboscis as long as or longer than the tube in which the pollen lies, and able to effect pollination are:—*Bombus hortorum*, *B. silvarum*, *B. lapidarius*, and *B. muscorum*, while of European species mentioned by Knuth in addition to the above are *Bombus senilis*, *B. confusus*, and *B. fragrans*. The habits, however, of two of the *Bombi* should be noted. With a proboscis varying in length (according as the worker or the queen is taken) from 7 to 9·75 mm., *Bombus terrestris* finds itself unable to reach the honey legitimately, and takes it by a back door, viz., by first biting a hole through the tube that contains the honey. Such treatment is, of course, harmful to the flower. *Bombus pratorum*, with a proboscis 8 mm. long, behaves in the same way. Once such a hole is made in the tube the honey can be got by other honey thieves without the flower being benefited.

The flowers of the red clover can be efficiently pollinated by insects that may not have a proboscis long enough to reach the honey, but which have strength or skill enough to pull the wings or keel apart, so that the anthers and stigma emerge. This is the case with, among others, the Hive or Honey Bee (*Apis mellifica*).

In several recent issues of the *Journal** attention has been drawn to the possible opening for the export of breeding stock to Brazil. The Board have now received, through the Foreign Office, a despatch and memorandum, prepared by Mr. Milne Cheetham, First Secretary at the British Embassy, which gives further information as to cattle raising in Brazil, and the breeds best adapted for crossing with the native stocks. Mr. Cheetham observes that interest has been attracted to this subject by an Agricultural Congress which has been held at Rio de Janeiro, and also by the National Exhibition, where a number of cattle, Brazilian and imported, were on view.

The question is a practical one for Brazil, because the pas-

* Aug., 1907, p. 303; March, 1908, p. 738; and April, 1908, p. 50.

They hold its ungainly appearance up to ridicule, and speak of the invasion of the consecrated beasts as a return to the Stone Age in the breeding of cattle. The opinions of two authorities have been given to the Press, and contain much that is of interest.

Views of Experts.—Señor Manoel Bernardez, an Argentine enjoying a considerable reputation as an expert in cattle, has written in a very convincing manner on the requirements of Brazil. After comparing its pastures favourably with the Plate, he points out irrefutably the advantages of importing the cattle from the latter from the point of view of freights, the cost of transport from the Plate to Brazil being only £4 per head, as against £30 to £60 per head from Europe, according to the place. Further, he argues that the best all-round animal is the Devon of Uruguay, asserting that this breed alone of the many introduced from Europe has proved capable of withstanding the droughts and the ticks, the reason for its being unaffected by the latter being that it has been born and bred for generations on the Uruguayan pampas, where the same ticks abound. According to him, too, the Devon is hardy, and in places where he has known Durhams, Herefords, Holsteins, Zebus, and some other breeds degenerate, Devons do well. He is sending 30 Devons to the Rio Exhibition with the intention of submitting them to various tests to prove their immunity against Texas fever.*

On the other hand, the recognised Brazilian expert, Dr. Carlos Botelho, late Secretary of Agriculture of the State of Sao Paulo, speaking from the results of his own experiments covering a number of years, gives it as his opinion that although he is inclined to favour English breeds (Shorthorn and Hereford) for the pastoral regions in the South of Brazil, and French and Swiss breeds for the States of Sao Paulo and Minas Geraes, he is convinced that there is no reason for regarding any one breed as more suitable than another for the requirements of Brazil. He contends that when one breed is lacking in one thing it makes up for it in another, each of

* In this connection, the Chief Veterinary Officer of the Board observes that Devon cattle are often reared on "Redwater" farms at home, and such cattle are very resistant to Redwater (Texas fever or *Tristesia*).

the recognised European breeds having something to commend it. Moreover, the pastures in Brazil are so diverse, comprising hillsides, meadows, table-lands, and pampas, that it is quite problematical which breed will do best in any particular district. He confesses that the farmers in this country are learning, and that this is among the things which have yet to be learnt. He is, however, sceptical in regard to the Jersey. While admitting that the Channel Island breeds in general are unequalled for milk, he is inclined to regard them as useless for beef, and as otherwise unsuited to the conditions of Brazil. His object is to introduce "dual-purpose" cattle. In respect to *Tristeza*, he states authoritatively that there is but one way to combat it. The animals imported must always be yearlings, or at any rate young, it having been found by experience that only such are really capable of resisting the disease. In this opinion he is borne out by Señor Manoel Bernardez, who, on the other hand, puts the age limit up to two years.

Number of Cattle in Brazil.—The number of cattle existing in Brazil is officially computed at about 18,000,000 head, which, being avowedly a very rough estimate, is doubtless incorrect. Nevertheless, an immense number change hands at the periodic fairs, as an instance of which it may be stated that 25,000 are sold annually at that of Itabaiana in the State of Parahyba. There is also an interchange of thousands every year among the various States, and many go to Paraguay, the animals being first bought up by "boiadeiros," who drive them at the rate of 10 or 12 miles a day over very long distances (sometimes even exceeding 350 leagues) before they dispose of them. They generally require fattening before they are passable as beef, and the market they go to is largely dependent on the lie of the land over which they have to travel. It is curious that while thousands of cattle are exported from certain corners of Brazil there is a demand for them in others. In connection with this it may be worth while to mention that contracts are in force at the present moment for the importation of animals from the Argentine and Venezuela.

Horses, Sheep, and Pigs.—In regard to horses, several English breeds have been tried, chiefly Hackneys, Shires, and Clydesdales, but the two latter have lately given way to

the more popular Percherons, which are suitable for other than merely draught purposes. English pigs have been to some extent imported, and are said to do well. The breeds best known are the Yorkshire, Berkshire, and Tamworth. Every kind of English sheep has been brought to Brazil at some time or another. Southdowns in particular are reported to have adapted themselves successfully to the climate, and given fine results in Rio Grande do Sul. The highlands seem to suit them, but it is doubtful whether Brazil, except in certain localities, will ever be a really great sheep-rearing country. The heat should scarcely be in favour of wool, and the heavy and continuous rains at times prevent the sheep from drying, as a consequence of which they sicken and die.

(b)
(c)

Live stock from the United Kingdom are imported into Denmark from time to time, though there is no permanent demand, except perhaps for horses.

Importation of Live Stock into Denmark. The following particulars furnished by Mr. Consul Liddell (F.O. Report, Annual Series, No. 4,089) indicate the present outlook for trade in this direction.

Horses.—In former times there were the two breeds, the heavy horse in Jutland and the light horse, the so-called Frederiksborg horse, on the islands. The heavy horse has been improved, and there are stallions which have fetched high prices. These horses, which are able to draw a heavy load while trotting, are largely used in Hamburg and other Continental towns as omnibus horses. The light horse has not improved, owing to the fact that all the best breeding animals were sold to Russia about a century ago. Since then unsuccessful endeavours have been made to improve the breed, and it is still an open question whether thoroughbred, half-bred, or East Prussian (Trakehner) stallions should be used. As carriage horses are most in demand the breeders do not care for thoroughbreds, especially since racing (with exception of steeplechasing for officers and some few civilians) has ceased, and has been replaced by trotting races, which are more to the liking of the populace. An American

trotting stallion from Kentucky was lately purchased at a cost of 40,000 kr. (£2,200).

Under these circumstances the Remount Commission, who have found it necessary to have thoroughbred horses at least for the cavalry, have had to buy part of the yearly number required, about 400, in Ireland, whereas the rest, 200 annually for the artillery, have generally been bought in Denmark. As it has often been urged by members of the Danish Parliament and horse-breeders that the horses for the army should be bought in Denmark, the War Office has now bought six thoroughbred stallions in the United Kingdom and stationed them in various places in the country where they may serve such mares belonging to the farmers as are suitable for the production of remounts. The last stallion bought was the eight-year-old stallion "Vendale," which was bought at a price of 14,000 kr. (£800). The breeders are, however, still rather dissatisfied, as they maintain that if horses are not selected for remounts they are not fit for any other purpose and that they do not fetch the prices they would if half-bred stallions were used. They therefore prefer the three East Prussian stallions which were first bought by the War Office and are still in use.

The horses used for steeplechasing or riding are all bought in the United Kingdom, carriage horses come generally from Germany. There is also a large import of ponies from Russia, which are largely used by farmers for light work, and are besides cheap to keep. The import of ponies from Iceland has also increased.

Cattle.—Two breeds of cattle are generally kept, the red Danish and the Angel (from Schleswig). Of these the first is undoubtedly the best milker, but the Angel is not so expensive to keep in proportion, and is therefore preferred in many places. During recent years, three farmers have commenced to keep Jersey cattle on account of the high percentage of fat in the milk these animals can produce, but generally the Danish cattle prove highly satisfactory, and there is hardly any import of pedigree animals. On the other hand, a considerable number of Danish pedigree cattle have been exported during later years, especially to Russia.

Swine.—Since the export of slaughtered pigs to the United

Kingdom was commenced the old breed of very fat swine has been replaced by the Yorkshire pig ; this breed has been kept pure. There are only a few breeders who prefer to mix it with the old Danish breed. Of the new Danish-Yorkshire pigs there is a considerable export to Russia of pedigree animals, as there is of the red Danish cattle, whereas pedigree animals are no longer imported from the United Kingdom.

Sheep.—Since the bacon industry has developed so much the number of swine has been increasing year by year, while the number of sheep is going constantly down. There are some few breeders who keep flocks of Southdown sheep, but there is neither import nor export, and generally speaking very little interest is taken in this animal.

With reference to the summary of the Canadian Order as to the Importation of Live Stock free of duty which appeared in this *Journal*, September, 1908,

Live Stock Import Regulations.—Canada.* p. 449, the Board have now received a copy of the Regulations issued by the Dominion Department of Customs to its Collectors, which came into operation on 1st July, 1908. The Regulations dated 1st June, in respect of the free entry under the customs tariff of horses, cattle, sheep, goats, asses, swine, and dogs, for the improvement of stock, are as follows :—

1. No animal imported for the improvement of stock shall be admitted free of duty unless the importer is domiciled in Canada or is a British subject, and furnishes a certificate of the record and pedigree in a list of registers designated from time to time by the Minister of Customs, showing that the animal is

* Live Stock import regulations have been published in this *Journal* for the following countries :—United States, Sept., 1906, and Sept., 1907; Argentina, Jan., 1905, April, 1905, Oct., 1905, and June, 1906; New South Wales, April, 1905; Germany, May, 1905; New Zealand, June, 1905; South Australia, July, 1905; France, Aug., 1905; Belgium, Sept., 1905; Uruguay, Oct., 1905; Victoria, Nov., 1905; Spain, Dec., 1905; Queensland, Jan., 1906; Western Australia, Feb., 1906; Tasmania, March, 1906; Transvaal, June, 1906; Ceylon, Cape Colony, Sept., 1906; Holland, Malta, Oct., 1906; Austria-Hungary, Nov., 1906; Russia, Hungary, Dec., 1906; Iceland, Italy, India, Feb., 1907; Isle of Man (sheep), Ireland, March, 1907; Canada, Isle of Man (swine), Jamaica, April, 1907; Norway, Sweden, Isle of Man (sheep), July, 1907; British Isles (horses), Nov., 1907, Feb., 1908; Natal, Dec., 1907; Cuba, Philippines, Oct., 1908.

pure-bred and has been admitted to full registry in a book of record established for that breed. An affidavit by the owner, agent, or importer that such animal is the identical animal described in said certificate of record and pedigree must be presented.

2. In case such certificate is not at hand at the time of the arrival of the animals, the entry for duty may be accepted, subject to the refund of the duty upon production of the requisite certificates and proofs in due form satisfactory to the collector, within one year from the time of entry.

3. The form of certificate of record and pedigree to be accepted for the free importation of animals for the improvement of stock, and the customs procedure in connection therewith, shall be subject to the direction of the Minister of Customs.

The original certificate of pedigree shall be marked in each case with the customs entry number and office dating-stamp, and be signed by the Collector of Customs, and a copy thereof shall be filed with the entry papers before the certificate is returned to the importer.

There shall also be noted on the face of the customs entry the description of each horse (or mare) admitted to free entry, viz :—Name, age, colour, height, marks.

A list of Registers or Books of Record was given, but this list was afterwards cancelled and that given in the subsequent Regulations substituted for it.

The further Regulations dated 12th June, 1908, are as follows :—

The Canadian Certificates of record and pedigree, with the exception of those for Holstein-Friesian cattle, must bear the seal of the Department of Agriculture.

In the case of horses, cattle, sheep, swine, goats, or asses registered as pure-bred, in a register or book of records, not in the published list designated by the Minister of Customs, such register or book of records may be accepted as being designated by the Minister when there is presented to the Collector of Customs a certificate of the record and pedigree with an "import certificate" attached thereto, issued from the office of the Canadian National Records, bearing the seal of the Department of Agriculture and certified by the Accountant of the Canadian National Records.

The said "import certificate" shall be filed by the customs officer, attached to the entry.

List of registers or books of record, in one of which the animals undermentioned must be registered as pure-bred before admission into Canada for improvement of stock free of duty :—

Class of Animals.	Register or Book of Record of the	Country where the Register is kept or published.
<i>Horses.</i>		
Clydesdale Horse Association of Canada...	Canada
Canadian Hackney Horse Society	Canada
Canadian Shire Horse Association	Canada
Canadian Percheron Horse Breeders' Association		Canada
Canadian Pony Society	Canada
Canadian Thoroughbred Horse Society	Canada
Canadian Belgian Draft Horse Breeders' Association		Canada
French Canadian Horse Breeders' Association ...		Canada

Class of Animals.	Register or Book of Record of the	Country where the Register is kept or published.
<i>Cattle.</i>		
Holstein-Friesian Association of Canada	Canada
Dominion Shorthorn Breeders' Association	Canada
Canadian Ayrshire Breeders' Association	Canada
Canadian Hereford Breeders' Association	Canada
French Canadian Cattle Breeders' Association	Canada
North American Galloway Breeders' Association	Canada
Canadian Aberdeen-Angus Association	Canada
Canadian Red Polled Association	Canada
Canadian Jersey Cattle Club	Canada
Canadian Guernsey Breeders' Association	Canada
<i>Swine.</i>		
Dominion Swine Breeders' Association	Canada
<i>Sheep.</i>		
Dominion Sheep Breeders' Association	Canada

In order to guard against the introduction of foot-and-mouth disease into Algeria, regulations which came into force on the 1st of September last pro-

Live Stock Import vide that imported cattle must be
Regulations.—Algeria. accompanied by a certificate of origin from the administrative authority of the place from which they come, stating that there does not exist, and has not existed in that place during the previous six weeks, any case of foot-and-mouth disease among cattle, sheep, pigs, or goats. The certificate is to give the number of animals and their description. A certificate of health issued by the Veterinary Inspector of the port of embarkation must also be provided.

Animals imported for breeding or dairying purposes will be quarantined for five days, or in the case of animals not provided with the necessary certificates for fifteen days.

By a decree dated 8th May, 1908, the period of quarantine imposed on cattle imported into Argentina from foreign

Live Stock Import countries for breeding purposes is
Regulations.— reduced from 40 to 30 days. The
Argentina. method of carrying out the examination for tuberculosis is also modified by the adoption of the ophthalmic reaction test, together with the injection of tuberculin at the close of the period of quarantine. Animals which prove to be tuberculous by the application of

both of these tests are to be slaughtered, while those which are suspected of being infected during the period of quarantine are to be removed to the Bacteriological Institute for further examination with the object of making a definite diagnosis.

The general Regulations as to importation of cattle into Argentina were given in this *Journal*, January, 1905, p. 615.

According to a Proclamation dated October 23rd, 1908, the importation of bovine cattle into Cape Colony will only be permitted through the ports of Cape Town, Port Elizabeth, and East London. All cattle are to be subjected to the tuberculin test by a Government Veterinary Surgeon. Immediately on

**Live Stock Import
Regulations.—
Cape Colony.**
arrival the cattle are to be placed in quarantine for 30 days in a place provided by the Government or by the owners, subject to the approval of the Inspecting Officer. At the end of the period they are to be tested, and if the test indicates the existence of tuberculosis the animals are to be destroyed. All expenses of inspection, quarantine, testing, destruction and otherwise are to be borne by the owner or importer, and are to be at the rate of 5s. per head for every day such cattle are necessarily detained for these purposes. These Regulations do not apply to cattle consigned direct by rail to any other Colony or State in South Africa, nor to cattle imported solely for slaughter.

The Legislature of the State of New York has passed a law establishing a Bureau of Veterinary Science in connection with the State Agricultural Department, and has voted about £15,000

**Suppression of
Tuberculosis in
New York State.**

to its expenses and the payment of compensation for condemned cattle.

The new law contains the following provisions:—Under certain restrictions animals which have tuberculosis may be kept for breeding purposes, and the milk may be used after pasteurisation at 185° F. These animals must be separated from healthy animals, and their young,

immediately after birth, must be separated from their mothers, but may be fed upon the milk drawn from affected animals after it has been pasteurised.

The owner of a herd of cattle may have his herd tested by tuberculin on application to the Commissioner of Agriculture, and on agreeing to improve the sanitary conditions of his premises, if required; to disinfect them if diseased animals are found; and to follow the instructions to prevent re-infection of the herd.

The sale of any animal known to have a communicable or infectious disease is prohibited, except it be for immediate slaughter, or except the sale be made under written contract, signed by both parties, specifying the disease with which the animal is infected, and a copy of the contract must be filed in the office of the Commissioner.

Information respecting the laws in force for the suppression of tuberculosis on the Continent appeared in this *Journal*, October, 1908, p. 494.

For upwards of half a century the village of Mawdesley in South-West Lancashire has been famous for its willow beds

Cultivation of
Willows in
Lancashire. and basket-making industry, and Mawdesley-grown rods have acquired a considerable reputation in the willow trade for strength and durability.

Mawdesley differs from most willow-growing centres in possessing very little wet or marshy land, and willows are grown under similar conditions to such farm crops as potatoes, cabbages, corn, &c. It is to this comparatively dry method of culture that the special toughness of the rods grown in the district is attributed.

An account of the willow cultivation in this district is given by Mr. W. Dallimore in the Kew Bulletin (No. 9, 1908), based on information supplied by Mr. Hugh Cowley, the largest grower in the district.

It appears that the pioneer of the movement in Mawdesley was Mr. Cowley's father, and his first venture was with a farm of about 23½ English acres. For many years the business proved highly satisfactory, and more land was con-

tinually acquired until he and his sons had about 500 acres under cultivation. Other farmers also planted largely when the trade was at its best, but of late years, owing principally to depression in trade and foreign competition, a considerable amount of land has been reclaimed for ordinary farm crops. According to Mr. Cowley, however, taking good and bad years together, willows pay at least as well as other farm crops.

When forming a willow bed, the ground is well worked and cleaned, and good, strong cuttings are inserted one foot apart in rows two feet apart. The majority form sturdy plants the first year, and are assisted by being kept perfectly free from weeds and by frequent working of the surface soil. In fact, to be successful with a crop of willows, Mr. Cowley contends that throughout life they must be kept as free from weeds as any other crop. A full crop of rods may be expected from strong-growing varieties the third year after planting, but weak-growing kinds require a year or two longer. Harvesting operations are got through as quickly as possible after the fall of the leaves. Usually, the stools are cut over annually, but when specially strong rods are required, they are allowed to remain for two years. When cutting the rods, great care is taken to remove them close to the stool. If this is not done, numerous buds are left, which result in large numbers of weak shoots the following year instead of a smaller number of more vigorous ones. As soon as possible after the removal of the crop, the ground is well cleaned and worked, and a dressing of manure is given. When carefully cultivated, a willow plantation will give good results for a very long period. There are fields in full vigour which have been down between 20 and 30 years, and still older ones exist. The destruction of a willow bed is a simpler operation than would be expected. A strongly horsed plough is run along a row close to the stools; it is then run along the opposite side, turning the stools over; men follow, and drag the plants out ready for the next furrow. In this way a field is ploughed in very little more time than a clear field would be.

When removed from the ground the rods are made into stacks and are left for use. Many of the finer-growing sorts are peeled for fancy work, and the peeling is done as

the rods are harvested. Previous to peeling they are soaked in boiling water. From the boiler they are taken to the stripping room where the bark is removed by women. The rods are then placed in a heated shed to dry, after which they are graded into sizes ready for use. Although attempts have been made to find a use for the bark they have so far failed, and it is simply a waste product.

A few years ago baskets of all descriptions were made both for English and foreign markets, but now only those kinds are made for which there is a local demand, and the majority of the rods suitable for fine work are sold ready for use. A brisk trade is carried on in potato hampers, and there is a good demand for pigeon and fowl baskets.

The majority of the varieties of basket-making willows grown in the country have been tried at Mawdesley, but most of them have been discarded as unsuitable for the district, and only a few selected forms of two or three species are grown, which are recognised by local names. An account of these varieties classed under their respective species is given in the Kew Bulletin mentioned above.

The Board of Agriculture and Fisheries have received a note from Mr. Thomas Milburn, Ph.D., of the Midland Agricultural and Dairy College, on the **Impurities in Seed.** subject of impurities in seed caused by travelling threshing machines, &c.

There is one point in connection with the proper treatment of grain during threshing which has hardly received the attention it deserves, and this is the importance of keeping samples true to kind. It is a common experience to find in the same field of grain different varieties or different genera growing together, and the loss caused by such mixing, though difficult to estimate, is beyond dispute. To take the case of barley, where evenness of ripening is a desideratum, if an early ripening variety contains even one per cent. of a late ripening variety, the crop is bound to be uneven, and consequently to be reduced in value. Some of this variation may be due to careless handling, or to mixing caused by rats, but one of the chief causes is the travelling threshing machine.

These machines are frequently stopped before they have run clear, and grain remains lodged in many parts, so that mixing inevitably results when threshing is started on some other farm. Another cause is the seed drill, which is frequently started without the cups, &c., being properly cleared. Farmers, therefore, should be careful to see that threshing machine drivers thoroughly clear their machines before starting, and that their men treat the drills in the same way.

Care should also be taken to see that grain intended for seed is put into perfectly clean sacks (oat grains especially cling to the inside of sacks of an open texture).

Mr. Consul L. C. Liddell in his report on the trade and commerce of Denmark for 1907 (Foreign Office Reports,

Annual Series, No. 4089) states that the

**Seed Control in
Denmark.**

demand for good serviceable seed has been brisk, and there is but little inferior seed now sold in Denmark. Credit for

this state of affairs must be attributed to the "Dansk Frøkontrol" (Danish Seed Control); this control was initiated by Mr. Holst, an agricultural expert and editor of a newspaper dealing with agricultural questions. He originally published his scheme in 1869, and it was at once adopted in Germany, where a controlling station was started in Tharand, in Saxony. This proving successful, Mr. Holst opened an office in Copenhagen in 1871. During the first years, however, he did not cover his expenses, and as these increased, owing to a more detailed examination of seeds being necessary, he was compelled to turn for assistance to the Royal Agricultural Society. From this source he received first a yearly subvention of £55, which was afterwards raised to £110. In 1891, after Mr. Holst's death, the institution was taken over by the State as a department under the Minister of Agriculture. In 1896 a sum of £3,100 was voted in the budget for the erection of a building. Since 1896 the State expenses in connection with the control have been about £360 per annum. The analyses are carried out in accordance with the regulations issued by the Minister of Agriculture, 16th March, 1901. The result has been that the leading firms in the seed trade now sell

exclusively "controlled" seeds, which are somewhat more expensive than the seeds that are not submitted to control. The institution is represented throughout the country by agricultural councillors attached to the agricultural societies. Their business is to buy samples of seed from time to time from dealers and send them for analysis. In case it is found that bad seeds are being sold in certain districts, the office may issue a warning to purchasers against buying seeds in these districts, but the office has no power to prosecute sellers of inferior seeds. This can only be done by taking civil action.

There seems, however, to be a growing desire among agriculturists that the sale of seed should be regulated by law, and it is possible that before long a Bill may be laid before the Rigsdag for this purpose.

The Board have received, through the Foreign Office, a report prepared by Mr. Vice-Consul de Luze on the fruit trade of Limousin. Mr. de Luze observes **Limousin Fruit Trade.** that travellers from Paris to Toulouse, emerging from the long pass where the River Vézère rolls its waters between two lines of mountains, see before them a wide and fertile valley. This valley, 60 miles in length, extends from the granite hills of Le Saillant to the Causses, passing by Brive and Beaulieu. It is planted throughout its length and breadth with fruit trees, which give it, during the month of May, the aspect of an immense orchard. The peasants who labour in the rich red soil of the district are a strong, hard-working race, highly skilled in the art of cultivating fine and beautiful fruit. From Limoges to Brive, by way of Objat, the same scenery presents itself. At Objat, one of the most flourishing and important centres of fruit exportation, hundreds of carts arrive daily from May to December laden with fruit and vegetables. There are no less than 70 exporters or commission agents in the Brive district.

Varieties of Fruit Grown.—The climate is particularly favourable to the growth of the Reine Claude plum (green-gage). More than 4,000 tons are produced, the chief centres being Brive, Objat, and Les Quatres Routes. The produc-

tion of the Blue, or St. Anthony's plum, which is excellent for jam, and the Royal plum amounts together to about 1,000 tons, the centres of sale being Veyrac, Les Quatres Routes, and Gramat.

Bigarreau cherries, which are a very good table fruit when ripened under favourable conditions, are less cultivated than the kind called Red Bigarreau, or Madrianne, which is a very pulpy fruit of medium size and of very marketable quality. The production is large, 2,588 tons being sent to England in 1905, chiefly from Objat and Brive.

There are several varieties of peach, but the conditions of transport are unfavourable.

A large table apple which is much grown is the Sainte Germaine, or De l'Etre. The total production is about 1,200 tons, and the centres of production are Masseret, Uzerche, Tulle, Juillac, Ayen, and Brive. German fruit merchants are said to have bought 800 tons of this variety this year.

A remarkable variety of chestnut is produced in Lubersac, Vigeois, Juillac, Uzerche, and Tulle, the total production amounting to 2,575 metric tons. In the south of the district the walnut takes the place of the chestnut in the north.

Potatoes, green peas, and melons are also grown, and truffles are produced in some districts.

The cost of shipment by fast train from Objat to London (464 miles) *via* Boulogne, for fruit is at the rate of £6 5s. 5d. per ton for small lots, and £5 18s. 2d. for 5 ton lots, and for vegetables £5 18s. 2d. and £5 6s. 8d. respectively. The charges *via* Calais are about 3s. higher. Goods generally arrive on the market the second day after their despatch, that is, in about thirty-six hours.

The outlet which Industrial Co-operative Societies possess for the sale of many classes of agricultural, dairy, and garden

produce, has suggested that there is an

**Sale of Eggs through
an Industrial
Co-operative Society.** excellent opening in many cases for these Societies to purchase produce direct from their members and others in the vicinity instead of obtaining their supplies from wholesale dealers. This is particularly the case

with Co-operative Societies in small country towns, many of whose members are engaged in agriculture or horticulture in one form or another.

A successful instance of this is afforded by the Wickham Market Industrial Co-operative Society, which at the beginning of 1906 undertook the collection of eggs, a branch of business for which it had special facilities, as its carts were regularly engaged in delivering goods to members scattered over a somewhat wide area. These carts in delivering groceries, &c., also undertook the collection of eggs, while, in addition, a cart was sent out specially once a week to supplement the other rounds. During the first six months after the experiment was started, 18,714 eggs were received, but the trade grew so rapidly that the total for 1906 was 155,000, and during 1907 the number was 449,000. Since then there has been a rapid increase, not only from wider collection, but also because as a result of better prices, producers have been stimulated to improve their methods, and the total number received in 2½ years has been 1,113,000. A very large proportion of the supply is purchased from members of the Society, but some are also obtained from non-members, who may at the same time purchase ordinary goods sold by the Society. It is stated in the *Journal of the National Poultry Organisation Society* that before the Society began to deal in eggs not more than 1s. for 22 or 24 eggs could be obtained in the plentiful season, but during the past season the price has never been below 1s. for 18, which is a considerable advance. The Co-operative Wholesale Society, to which the Wickham Market Society is affiliated, has been a regular customer, and the marketing section of the National Poultry Organisation Society has also helped to dispose of large quantities weekly.

During the *first* week in December the conditions were mostly dry, rain being slight and infrequent. The temperature was above the average generally, the excess being greatest in the north and east of

Notes on the Weather in December. Scotland, and the south-west of England. In England N.E. and N.W., the temperature was below the average. Rainfall was light or very

light in all districts except Scotland, W., where it was moderate. Bright sunshine was very slight in many parts of England, and entirely wanting at Greenwich, Westminster, and most of the stations in England E., as well as

in some other parts of England. In Scotland E., and England N.E., there was a slight, and in England N.W. a more decided, excess.

In the *second* week, the weather was very changeable. The temperature was above the average in all parts, and the rainfall also exceeded the average in all districts except Scotland E., the excess being rather large in several parts of the kingdom, viz., Scotland N., England E., S.E., and S.W. Bright sunshine was more than the average, except in England E., and the English Channel.

In the *third* week, the weather was in an unsettled condition very generally, most regions experiencing a large amount of cloud, and rain on at least five or six days. Temperature exceeded the average, and was reported as "unusual" in all parts of England. Rainfall was above the average over the greater part of England, and in Scotland W., but less in England N.E., and the north and east of Scotland. Bright sunshine exceeded the average in Scotland, but was less than the normal in England.

In the *fourth* week, ending on the 26th December, the weather, although generally dull, was not often rainy, except on the extreme west and north-east coasts of Ireland and Scotland, and even in these districts the rain was not often heavy. Temperature continued above the average until late in the week, when it underwent a sudden fall and became low. Rainfall exceeded the average in Scotland N., but was less elsewhere, the deficit being large over England. Bright sunshine was below the average, except in Scotland N., and England N.W. The percentage of the possible duration ranged from 20 in the last-named district to less than 10 in nearly all parts of the kingdom. In Scotland W., only 1 per cent. was recorded, while in England E. the week was sunless.

Notes on Crop Prospects Abroad.

Germany.—According to returns issued by the Imperial Statistical Bureau (*Reichsanzeiger*, 17th December, 1908), the area and yield of crops in Germany in 1907 and 1908 were as follows:—

	1908.		1907.	
	Acres.	Tons.		
			Acres.	Tons.
Wheat	4,654,962	3,767,767	4,314,564	3,479,324
Rye	15,116,235	10,736,874	14,925,173	9,757,859
Barley	4,023,548	3,059,885	4,203,216	3,497,745
Oats	10,560,003	7,694,833	10,811,474	9,149,138
Potatoes	8,132,838	46,342,726	8,144,783	45,538,299

Russia.—The Board have received through the Foreign Office a despatch, dated 30th November, 1908, from Mr. Cooke, British Commercial Agent in Russia, giving the returns issued by the Central Statistical Committee of the grain harvest of 1908. These estimate the yield of winter wheat at 78,986,000 cwt., as against 86,471,000 cwt. in 1907, and of winter rye at 383,252,000 cwt., as compared with 392,576,000 cwt. in the earlier year. The winter grain yield is 11 per cent. below the average of the last five years, and is described as "nearly average." The *Novaia Russ.*, in commenting on these figures, observes that the last five years have been marked by grievous crop failures, either partial or general, and the average, therefore, is extremely low.

Mr. Consul-General Smith, writing from Odessa on 5th December, states that so far the prospects of the 1909 grain crop are very good. Sowing was a little late, but was conducted under favourable circumstances, and at the time of the first frosts the winter crops looked very well.

A later report, dated 26th December, states that at the beginning of the autumn the weather in the northern part of Russia was too wet for the easy preparation of the ground and too cold for the good growth of winter seed; in the central portions it was about normal, and in the south it was warmer than usual, and over-dry. Much variation in the weather followed, but about the middle of December it was stated that the greater part of European Russia had a promising winter crop; in other parts the crop is precarious, and in considerable areas it is unpromising.

India.—According to a telegraphic report in Beerbohm's Corn Trade List (31st December), the official estimates for Bombay and Sind, the Central Provinces and Berar, and the North-West Frontier, give the area under wheat as 5,911,000 acres as against 5,671,000 acres last year.

United States.—The final estimate of the United States crops issued by the Bureau of Statistics of the Department of Agriculture is as follows:—

	1908.		1907.	
	Thousands of acres.	Thousands of bushels.	Thousands of acres.	Thousands of bushels.
Wheat	47,557	664,602	45,211	634,087
Maize	101,788	2,668,651	99,931	2,592,320
Oats	32,344	807,156	31,837	754,443
Barley	6,646	166,756	6,448	153,597
Potatoes	3,257	278,985	3,124	297,942

The World's Hop Crop.—The Board have received the Report issued by Messrs. John Barth and Son, of Nuremberg, on the hop crop of 1908. According to the estimate of this firm, the area under cultivation in the past season has amounted to 269,244 acres, as compared with 286,460 acres last year. The total production is put at 1,978,000 cwt., as against 1,881,800 in 1907, 1,577,000 in 1906, and 2,428,000 in 1905. The figures for the principal countries are as follows:—

	1907.						1908.	
	Thousands of cwts.						Thousands of cwts.	
Germany :								
Bavaria	258	301
Wurtemberg	60	67
Baden	28	34
Alsace Lorraine	93	102
Prussia and other districts	22	22
Austria-Hungary :								
Bohemia	232	255
Other districts	81	60
France	78	79
Belgium and Holland	54	77
Russia and other Continental countries	79	74
England	373	491
America	510	402
Australia	14	14
							1,882	1,978

The Board of Agriculture and Fisheries have been furnished by the Board of Trade with the following report, based on about 210 returns from correspondents in various districts, on the demand for agricultural labour in December :—

Agricultural Labour in England during December. Employment was, in general, regular throughout December, but in most districts day labourers lost time at the end of the month through the severe weather. In many districts the demand for men of that class was not sufficient to give employment to all.

A comparative statement of wages paid to ordinary agricultural labourers in December, 1908, and December, 1907, was shown on 195 Returns. Of these 174 showed no change, 2 showed an upward movement, while 19 showed a downward movement, 6 of the 19 related to districts in Norfolk, where a winter reduction of 1s. a week was made in 1908 which had not been made in 1907.

Northern Counties.—Employment was fairly regular in *Northumberland*, *Cumberland*, and *Westmorland*, in which counties the supply of labour was fully equal to a somewhat limited demand. Threshing and other work provided a fair amount of employment in *Lancashire*. A number of agricultural labourers were reported to be in irregular work in *Yorkshire*, partly on account of stormy weather at the end of the month, which caused day labourers to lose time, and partly on account of an insufficient demand for their services.

Midland Counties.—Unfavourable weather interrupted the employment of day labourers at the end of the month in *Cheshire* and *Derbyshire*, where there was only a moderate demand for this class of labour. Threshing, root-lifting, and manure-carting provided fairly regular employment in *Nottinghamshire* and *Leicestershire*. There was a fair demand for day labourers in *Staffordshire* and *Shropshire*, but in many districts the supply was more than sufficient. A few day labourers were in irregular employment in *Worcestershire* and *Warwickshire*. There was generally regular work for agricultural labourers in *Northamptonshire* and *Oxfordshire* until the end of the month, when the weather caused day labourers to lose time. In *Buckinghamshire* the demand for day labourers was not equal to the supply, and some men were consequently in irregular work. Employment was generally regular in *Hertfordshire* and *Bedfordshire*, except during the last week, when day labourers lost time through wet and snowy weather; the supply of labour was about equal to the demand.

Eastern Counties.—Threshing, hedging, ditching, &c., caused a fairly good demand for extra labour in *Huntingdonshire* and *Cambridgeshire*, and little or no surplus was reported. Employment was generally regular in *Lincolnshire*, with the supply of labour about equalled by the demand; in the Lincoln Union a correspondent stated that more day labourers could have been employed. Work on the root crops, threshing, carting manure, hedging, and ditching offered a good deal of employment in *Norfolk* and *Suffolk*; in several districts, however, the demand for extra labourers was affected by the forward state of work, and there was a consequent irregularity of employment for some men of this class. Employment was fairly regular in *Essex*, but owing to the forward state of work the supply of day labourers was somewhat in excess of requirements, and in addition some men of this class were hindered at the end of the month by bad weather.

Southern and South-Western Counties.—Employment was fairly regular in *Kent*; a number of day labourers, however, were unable to get regular work, on account of an insufficient demand. Threshing, hedge-trimming, and manure-

carting provided fairly full and regular employment in *Surrey* and *Sussex*, but the supply of day labourers tended to be in excess of the demand. A scarcity of men for permanent situations was reported from certain Unions. Several day labourers in *Hampshire* were in irregular employment owing to an excess in the supply of labour, while bad weather at the end of the month caused further loss of time to this class of men. Difficulty in obtaining men for tending stock was reported in the Petersfield Union, owing to an objection to Sunday work. In *Berkshire* employment was generally regular, and the supply of day labourers about equal to the demand. Threshing, securing root crops, hedging and ditching, and manure-carting caused a fair demand for extra labour in *Wiltshire*, but it was generally more than met by the supply. The supply of, and demand for, day labourers were generally about equal in *Dorset* and *Somerset*. There was only a moderate demand for extra labour in *Herefordshire*, but employment was fairly regular on the whole; some scarcity of men for permanent situations, however, was reported. Threshing, hedging, trimming, ditching, and manure-spreading caused a fairly good demand for labour in *Gloucestershire*, but the supply was sufficient. Employment was fairly regular in *Devonshire* and *Cornwall*, though somewhat interrupted at the end of the month by wet weather. Day labourers were in fair demand for hedge-trimming, carting manure, and work on the root crops.

Destruction of Charlock by Calcium Cyanamide.—A note was given in this *Journal*, Dec., 1907, p. 568, on the use of calcium cyanamide as a means of destroying charlock. Some further experiments carried out at the Agricultural School at Arenenberg, Switzerland, are described in the *Deutsche Landw. Presse* (4th Nov., 1908).

Miscellaneous Notes.

It appears that in 1906, when this manure was used for grass,

it was observed that all kinds of weeds were severely burnt, although the grass was favourably affected. This suggested the possibility of a similar action on charlock in corn, which would enable the grain to be manured at the same time as the charlock was destroyed. A plot of about a quarter of an acre in a field of barley with first-year single-cut clover was dressed with 22 lb. of calcium cyanamide on the 5th June. The weather was hot at the time, but in the following night there was heavy rain. The cyanamide was applied by hand, which was somewhat troublesome, owing to its corrosive and dusty nature. An inspection a month later showed the result to have been very satisfactory, no trace of charlock could be seen, and the barley was about 4 inches higher than the rest. The clover seemed to have suffered somewhat, but not to any extent. Closer examination showed a few stalks of charlock in flower, but almost entirely without leaves; these were evidently old plants which the cyanamide had not been able to kill, although it had destroyed the leaves and had so promoted the growth of the barley that the charlock could do no further damage. Other weeds had also suffered more or less.

Agricultural Credit Bank in the Transvaal.—A short account of the Transvaal Land and Agricultural Bank Act, 1907, was given in this *Journal*, Feb., 1908, p. 690. The Act has now been amended (No. 37 of 1908) in several respects as regards the scale of repayments. An advance may be made for any of the objects for which a co-operative society may be formed under the Co-operative Agricultural Societies Act, 1908, on the security of a first mortgage on its immovable property, together with the machinery, buildings, improvements, and fixtures, to an amount not exceeding one-half of the value. Advances may also be made to co-operative societies on the security of any raw or manufactured produce, or of the joint and several liability of members of the society, for the purpose of enabling the society to make loans to its members on the produce supplied to it.

Definition of Cider and Perry in France.—The Regulations of 28th of July, 1908, for the prevention of fraud in the sale of cider and perry provide that no drink is to be sold (1) under the name "cider" unless it is derived exclusively from the fermentation of the juice of fresh apples, or a mixture of fresh apples and pears extracted with or without the addition of water; or (2) under the name "perry," unless it is derived exclusively from fresh pears with or without water. The term "cidre pur jus," or "poiré pur jus," is reserved for cider obtained without the addition of water. The term cider or perry is reserved for cider or perry containing at least 3·5 of alcohol, 12 grams per litre of dry extract per 100 degrees (sugar deducted), 1·2 grams of mineral matter (ash) per litre. Cider or perry falling below these limits is to be called "petit cidre" or "petit poiré."

Production of Fruit Crops in the Neighbourhood of Wisbech.—The Board of Agriculture and Fisheries have been supplied with some carefully compiled estimates of the production of the fruit crops in the neighbourhood of Wisbech.

The ordinary rent of farm land is put at £2 per acre, while small occupiers of selected land adapted for fruit growing and conveniently situated may pay from £2 10s. to £4 per acre. In a few instances large farms occupied by old tenants are rented for less than £2 per acre. There is not a great difference in the rent of medium-sized fen farms and those on silt land.

A good crop of strawberries is estimated at 3 tons, and a moderate crop at half that amount. An average price is £17 per ton. From full-grown gooseberry-bushes a return of 6 to 8 tons is regarded as a good crop, and of 2 to 3 tons as a moderate one. These are valued at £9 a ton. Plums in this locality are generally grown round the orchards near the dykes, chiefly for shelter, but an acre of mature trees might be expected to yield 5 tons at £6 a ton, while a more moderate crop would produce 3 tons.

As regards apples from full-grown trees, 10 tons an acre should be secured in good years, and about half this quantity in less favourable seasons. The price would be about £7 a ton. Bramley's seedling would possibly yield much more on a good soil, while choicer and more delicate kinds would produce less. Owing to the variation in seasons, age of trees, and kinds of apples, it is difficult to arrive at an average.

Effect of Boiling Cider in Copper Vessels.—An inquiry was recently addressed to the Board as to whether, in the event of cider being boiled in a copper vessel, the quantity of copper dissolved would be likely to affect the juice in such a way as to make it injurious to health.

In order to test this point, experiments have been carried out at the Government Laboratory with freshly prepared apple-juice of similar character and density to the juice used in the preparation of cider, and it has been found that a small quantity of copper is dissolved by the juice as a result of boiling it for one hour in copper vessels. Two different copper vessels were used, and the amount of copper dissolved in the two experiments was (1) 0·004 gram of copper and (2) 0·002 gram of copper for 100 cubic centimetres of apple-juice. These quantities are equivalent to 0·35 and 0·18 grain of copper, respectively, per pint of juice. It is not anticipated that any serious danger to health would arise from so small a quantity.

American Gooseberry Mildew in Germany.—With reference to the note in this *Journal* (August, 1908, p. 384) as to the occurrence of American Gooseberry Mildew in Germany, it appears that the Hohenheim Institute for Plant Protection has now discovered the disease in Wurtemberg, where its existence had not been previously observed. It has now been reported in East and West Prussia, Posen, Pomerania, Mecklenburg, Brandenburg, Schleswig-Holstein, Hanover, Waldeck, Bavaria, and Wurtemberg, as well as in West Russia, Finland, Sweden, Norway, Denmark, and in Moravia and Salzburg in Austria.

Injury to Plants by Fumes from Factory Chimneys.—The growth of plants and trees is frequently injuriously affected in the neighbourhood of works where large quantities of coal are burnt, or where certain processes are carried on which result in the production of sulphuric acid and other gases. The Ministry of Finance for the Kingdom of Saxony has, therefore, offered two prizes, one of £100 for the best summary of the literature on the subject, with the proposals which have been made, and the other of £500 for the discovery of a means of dealing with these injurious gases applicable to ordinary industrial conditions. The second prize would be subject to a two years' practical trial. The patent rights of the discovery would remain in the hands of the inventor. Further particulars are given in the "Landw. Versuchs-Stationen," Vol. Ixix., parts 3 and 4.

Demand for Superphosphates in Italy.—H.M. Consul at Venice reports that the demand for British superphosphates and slag is increasing in Italy, as they are highly esteemed by wealthy landowners. There has been a great development in the constitution of agricultural committees or syndicates, and large sums of money are yearly expended by them in purchasing goods and distributing them to the landowners or tenants who are members of the union. (*Board of Trade Journal*, October 15, 1908.)

Demand for Agricultural Machinery in Colombia.—From an article published in the October issue of *La Colombie* (Brussels), it appears that there is a steadily increasing demand among the farmers in Colombia for agricultural machinery. There is, according to that publication, a considerable business to be done in ploughs, rakes, sowing and other agricultural and harvesting machines. A decided preference is shown for implements of simple construction but of good quality, for which good prices can be obtained. (*Board of Trade Journal*, October 15, 1908.)

Proposed Floating Agricultural Machinery Exhibition for Siberia.—The *Journal de St. Pétersbourg* of 5th October reports that a project is on foot for fitting out a floating agricultural machinery exhibition for Siberia. The exhibits would be grouped on boats which during their course down the river Yenesei would stop at the principal towns, where the exhibitors would show new types of agricultural machines. (*Board of Trade Journal*, October 15, 1908.)

Grain Trade of Odessa.—H.M. Consul-General at Odessa (Mr. C. S. Smith) in his report on the trade of that Consular District for 1907 (Foreign Office Reports, Annual Series, No. 4,138) draws attention to the changed methods which now prevail in the grain export trade. Mr. Smith cautions traders to deal only with firms of well-established character, and also refers to the proposals in connection with the new Odessa grain harbour, and the introduction of grain certificates.

Importation of Fertilisers into Norway.—The British Vice-Consul at Bergen (Mr. E. F. Gray) reports that the importation of artificial manures into Norway is steadily increasing, having risen from 5,716 tons in 1890 to 18,777 tons in 1900, while in 1907 it amounted to 45,682 tons (chiefly basic slag), valued at over £105,000. This increase is believed to be due to the advance of agriculture and the adoption of more intensive methods of cultivation. (*Board of Trade Journal*, December 3, 1908.)

Poultry Exhibition at Paris.—The French *Journal Officiel* of 20th November contains a Presidential Decree, dated 16th November, which constitutes as a Customs warehouse the grounds of the International Exhibition of Aviculture, to be held at the Cours-la-Reine, Paris, from 4th to 10th February, 1909. Articles intended for exhibition there may be forwarded through to their destination under international or ordinary transit regulations without Customs examination at the frontier.

Timber Resources of Siberia.—The *Board of Trade Journal*, October 8, 1908, contains information respecting the timber resources of Siberia, which has been supplied by the British Vice-Consul at Vladivostock.

Cultivation and Marketing of Maize.—An article in the “Imperial Institute Bulletin,” Vol. vi., No. 3, contains an account of the climate, soil, and methods of cultivation of the maize plant, together with information as to storage and transport. The system of grading adopted in the United States is described, and the grading regulations both for that country and for Natal are given.

OFFICIAL CIRCULARS AND NOTICES.

American Gooseberry Mildew (Prohibition of Importation of Bushes) Amendment Order of 1908. (No. 2.)—This Order provides that the American

**Importation of
Gooseberry and Currant
Bushes.** Gooseberry Mildew (Prohibition of Importation of Bushes) Order of 1907 shall not apply to the landing of any currant bush under the authority of a licence authorising such landing obtained from the Board of Agriculture and Fisheries, nor to any bush so landed. A penalty not exceeding £10 is imposed for irregular dealing with imported bushes, and a power of entry is given to inspectors of the Board of Agriculture and Fisheries or of the local authority appointed under the Destructive Insects and Pests Acts, 1877 and 1907. If on examination an inspector finds any bush which is affected with American Gooseberry Mildew (*Sphaerotheca mors-uvae*) he is to prohibit the removal of any gooseberry or currant bush from the premises. The Order came into operation on December 21st, 1908.

The Board have addressed the following circular, dated 24th November, 1908, to the local authorities in Great Britain. The

**Methods of Analysis
under the Fertilisers
and Feeding Stuffs
Act.**

Regulations referred to may be obtained from Wyman & Sons, Fetter Lane, E.C., price 1*d.* each.

SIR,—I am directed by the Board of Agriculture and Fisheries to enclose herewith copies of the Fertilisers and Feeding Stuffs (Methods of Analysis) Regulations, 1908, and of the Fertilisers and Feeding Stuffs (General) Regulations, 1908.

The Fertilisers and Feeding Stuffs (Methods of Analysis) Regulations, 1908, have been made by the Board in pursuance of powers conferred on them by Section 4 (1) (c) of the Fertilisers and Feeding Stuffs Act, 1906, in order to obviate the risk of discrepancies between analyses made for the purposes of the Act by different methods. These Regulations are based on advice given to the Board by a Committee of analytical experts who were appointed by the Board in 1906 to advise them in this matter. They relate only to the determination of the nitrogen, soluble phosphates, insoluble phosphates, and potash in fertilisers, and of the oil and albuminoids in feeding stuffs, as the Committee decided that it would not be practicable to prescribe methods for the other analyses which might be required under the Act.

The object of the Fertilisers and Feeding Stuffs (General) Regulations, 1908, is to amend Article 5 of the Fertilisers and Feeding Stuffs (General)

Regulations, 1906 (*Citric Acid Solvent*), and to extend its scope to all fertilisers containing phosphates.

I am to suggest that copies of this letter and of the two Regulations referred to should be supplied to the Official Agricultural Analyst for the district of your Local Authority. Duplicate copies are enclosed for the purpose.

I am, &c.,

T. H. ELLIOTT,

Secretary.

The Agricultural Holdings (England) Rules of 1908, dated 28th November, 1908, and made by the Board of Agriculture and Fisheries, in exercise of their powers under the Agricultural Holdings Act, 1908,

**Agricultural Holdings
(England) Rules
of 1908.**

prescribe the form of an award in an arbitration under the Agricultural Holdings Act, 1908, together with the several forms for proceedings in arbitrations under the said Act. The Rules extend to England and Wales only, and the Agricultural

Holdings (England) Rules of 1900 remain in force for the purpose only of arbitrations under the Agricultural Holdings (England) Acts, 1883 to 1900.

SUMMARY OF AGRICULTURAL EXPERIMENTS.*

EXPERIMENTS WITH CLOVER AND GRASS.

Improvement of Hill Pasture (*Trans. Highland and Agric. Soc.*, 1908).—The experiments dealt with in this report were begun in 1901, and were carried out by the Highland and Agricultural Society and the West of Scotland Agricultural College, with the co-operation of the Board of Agriculture. They were intended to test the effect of certain manures on various types of poor hill pastures, and comprised five plots of four acres each at each centre, except one where three acre plots were used. The improvements effected by the manures were measured by feeding stock on the plots, and determining the increase in live-weight of the stock, as it was considered that this method of experiment was the best available for measuring the feeding value of pasture, which depends not merely upon the quantity of herbage yielded, but even more upon its nature and quality. The stock fed was almost entirely sheep, though in a few cases cattle were also fed.

One plot was not treated in any way, and represented the unimproved condition of the pasture. The treatment given to the other four plots was as follows:—Plot A.—Sheep fed with a mixture of equal parts of decorticated and undecorticated cotton-cake on the plot. Plot B.—Basic slag, 10 cwt. per acre. Plot C.—Basic slag, 10 cwt. per acre, and

* A short review or summary of the experiments carried out in this country, classified according to subject, is given monthly. This summary is not intended to do more than give a brief indication of the character of the experiment and of the conclusions reached. Those who are interested in any particular investigation can refer for further details to the original publication. The Board would be glad to receive for inclusion in this summary copies of reports on inquiries, whether carried out by agricultural colleges, societies, or private persons.

sulphate of potash, 210 lb. per acre. Plot D.—Superphosphate, 9 cwt. per acre, and ground lime, 10 cwt. per acre. The basic slag and superphosphate applied on plots B, C, and D supplied about 200 lb. of phosphoric acid per acre, and the sulphate of potash on Plot C supplied 100 lb. of potash per acre.

Plot A was manured through the manurial residue of the cake fed to the sheep. In the case of the East of Scotland experiments the cake feeding was continued for four years, 1902 to 1905, and during 1906 and 1907, when it was discontinued, the effect of any residue it had left in the soil was measured. In the case of the West of Scotland experiments cake feeding was continued for five years, 1902 to 1906, and no attempt was made to measure its residual manurial effect.

The general results of the experiments are summarised as follows :—

1. The great and rapid improvement which was effected by phosphatic manures, and especially by basic slag, in the case of the well-known experiments at Cockle Park in Northumberland, has not been obtained on any of the plots in Scotland.

2. An improvement was effected by all the manures, but of the manures used, only basic slag has in general effected sufficient improvement to make the application remunerative.

3. Even in the case of basic slag, on the average three or four years elapsed before sufficient return was obtained to pay for the slag. On the other hand, the effect of the slag is by no means exhausted even after six years, but in the case of the majority of the experiments it is still giving as great, or nearly as great, returns as ever.

4. Potash, in the form of sulphate of potash, applied along with basic slag, though it gave a small increase in most of the experiments, did not give sufficient return to pay for its cost. Though the same dressing of potash could be obtained a little more cheaply in other forms, there is no reason to suppose that the results would be essentially different on these soils.

5. Superphosphate and lime in all cases gave a considerable increase in mutton, but did not in general give sufficient return to be remunerative. In no case did it give so good a return as the cheaper dressing of slag alone.

6. The feeding of cake gave the worst return of all for the expenditure. So far as the experiments show, very little result is recoverable from the manure value of cake on these soils.

7. At some of the centres the soil was covered with a very thick coarse sod of grass of poor quality. On such land clover plants have not room to develop, and in these experiments the effect of the manure is shown only very slowly. Sheep alone are unable to eat down the grass sufficiently, and better results are obtained when both sheep and cattle are grazed on the same plots.

Manuring of Grass Land (Jour. Roy. Agric. Soc., Vol. 68, 1907).—Two fields of old pasture are under experiment at Woburn, and results for two years are given in this report. On Broad Mead, manure was applied in 1904, and again in 1906-7. In 1905 the least increase was obtained from the plots receiving (a) 2 tons lime, and (b) 12 tons farmyard manure. There was nothing to choose between 10 cwt. basic slag and 5 cwt. superphosphate, each used along with 1 cwt. sulphate of potash, while the highest return came from 10 cwt. basic slag and 1 cwt. nitrate of potash. In 1906 the plots were all grazed. In 1907, after

further manuring, the plots manured with basic slag or superphosphate, along with potash salts, were the best, though farmyard manure gave a large crop of a coarse character. The herbage was examined botanically, and in 1905 the percentage of clovers was low, particularly when compared with 1903. After the further manuring, however, the proportion went up again in 1907, and the plot receiving superphosphate and potash showed, as in 1903, the highest percentage.

The plots on Long Mead were manured in 1903 and 1906-7. The highest yield was obtained from 5 cwt. superphosphate and 1 cwt. sulphate of potash.

Another field at Woburn (Great Hill Bottom) was, as regards a large portion, laid down with grass in 1886 and 1888. Lime (2 tons per acre) had, in 1899, been put on a strip along the top side of the field, and basic slag (8 cwt. per acre) on a similar strip along the lower side, but both of these applications failed to make any impression. In December, 1904, the lime dressing was repeated, and 3 cwt. per acre of superphosphate and 1 cwt. of sulphate of potash given to the upper side, while the basic slag was repeated on the lower side with the addition of 1 cwt. per acre of sulphate of potash. Though basic slag had till then resulted in no improvement, it now, with the sulphate of potash added, began to cause a marked change in the pasture; clover began to come, first here and there, and gradually over the whole area, until in 1906 there was quite a carpet of white clover, which spread gradually to the upper end of the field, the improvement in which from the use of lime, superphosphate and sulphate of potash, had not hitherto been so decided. Dr. Voelcker observes that it is remarkable that such a change should have been effected, and the result would seem to point to some joint action of the two materials, basic slag and sulphate of potash, inasmuch as each had been tried separately on the grass land of the farm without benefit accruing.

The figures are given of the production of hay from two plots laid down in 1901 with the grasses and deep-rooting plants recommended by Mr. R. H. Elliot of Clifton Park, Kelso.

Manuring of Grass Land (Harper-Adams Agric. Coll., Field Expts., Report, 1907).—An experiment in the manuring of old pasture was commenced in 1903, at the College Farm, and this report gives the results for 1907. The dressing which had the most satisfactory effect, both in 1907 and in the previous years, was $2\frac{1}{2}$ cwt. of superphosphate and $\frac{1}{2}$ cwt. of sulphate of potash applied annually. Nitrate of soda, again, gave an insufficient return to compensate for the outlay. A very noticeable feature was the effect of a combination of nitrate of soda and sulphate of potash. The application of $\frac{1}{2}$ cwt. of sulphate of potash has resulted in a small profit over the five years, whereas the addition of $1\frac{1}{2}$ cwt. nitrate of soda caused no addition to the crop, and consequently resulted in a loss. The application of $1\frac{1}{2}$ cwt. nitrate of soda alone gave a small increase, but not quite sufficient to cover the cost. Ten tons of dung proved profitable as regards quantity of produce.

An experiment was carried out on a farm near Oswestry, in which the manures which have done best at the College Farm during the past four years were tried, together with an additional plot manured with basic slag. The results in the first season were decidedly in favour of the application of artificial manures, but the experiment is being continued.

Experiments are also in progress on five farms in Staffordshire, and the results are given for several years.

Manuring of Meadow Land (*Univ. Coll. of Wales, Aberystwyth. Reports on Expts.*, 1906).—An experiment which is to be continued for a number of years was commenced on a farm at Waunifor. Fifteen small plots were dressed with various artificial manures, and the results are given, both as regards the total yield, and the value of the crops after deducting the cost of the dressing. The best returns were obtained from complete dressings, and it is remarked that “as is generally the case with meadow land in Wales, where many crops have been removed in succession without any return being made in the form of either natural or artificial manures, a full and profitable crop cannot be obtained without supplying to the land the three most essential ingredients of plant food.” Some observations are made on the character of the herbage resulting from the application of the manures.

Another experiment, commenced in 1905, was intended to determine the effect of farmyard and artificial manures on the yield of hay. The conclusions arrived at are (1) that in manuring meadow land the best results are obtained by using a complete dressing; (2) that of the three ingredients of plant food, nitrogen is the one most required, and potash least of all; (3) that the application of lime is unremunerative, and even tends to reduce the crop of hay produced; (4) that alternate dressings of farmyard and artificial manures not only yield very heavy crops, but they are also most profitable. The experiments were carried out on a field of light loam, which had been mown for several years without the application of much manure of any kind.

A somewhat similar experiment is also in progress on another field at the College Farm, which has been grazed for many years, the object being to test the effect of the various manures on the quantity and quality of the herbage. As the experiment is to be continued over a long period, the report only gives a statement of the results in 1906.

Manuring of Pasture (*Agric. Students' Gazette, Cirencester, Vol. XIII. Part 4; Vol. XIV. Part 1*).—These two publications contain reports on the results obtained in 1907 and 1908 from 20 plots, each $\frac{1}{20}$ acre, which have been manured experimentally at Cirencester for some seventeen years or more.

Manuring of Pasture (*Beds. C. C. Agric. Education Com., Report on Demonstration Plots, 1907*).—Demonstrations were carried out at two centres, but it is stated that it is difficult to draw any decided conclusions from the results obtained.

Manuring of Old Pasture (*Armstrong Coll., Newcastle-on-Tyne, Agric. Dept., College Bull. No. 7*).—Experiments in the manuring of old land hay have been carried out at six centres in Cumberland for thirteen years, at three centres in Durham for six years, at one centre in Northumberland for thirteen years, and at Cockle Park for eleven years. The results were summarised in this *Journal*, July, 1908, p. 284.

Experiments have also been carried out in Cumberland to test the effect of manures on poor peaty and marshy lands, of which large areas exist in that county. A summary of these experiments was given in this *Journal*, May, 1908, p. 120.

Manuring of Seeds Hay (*Edinburgh and East of Scotland Coll. of Agric., Bull. XIII*).—Experiments in the manuring of seeds hay have been conducted by the Edinburgh and East of Scotland College of Agric-

culture for the three consecutive seasons 1904-6 at fifty-one centres. The fertilising ingredient that has produced the largest weight of crop has been nitrogen. This has given equally good results, either in the form of nitrate of soda or sulphate of ammonia, and the best results from a mixture of the two.

The plots receiving the largest amount of nitrogen have given the heaviest crops, and valuing their produce at the same rate as that grown on the other plots, they have given the best financial return. Generally, however, it does not seem advisable to apply more than 2 cwt. of nitrate of soda.

Phosphates and potash applied alone, and also in combination with nitrogen, have been remunerative. Their effect in preventing exhaustion of the soil, and in improving the quality of the hay, warrants their inclusion in any artificial dressing for this crop. The mixture which is recommended as most likely to give general satisfaction is $\frac{1}{2}$ cwt. of nitrate of soda, $\frac{1}{2}$ cwt. sulphate of ammonia (both 95 per cent. purity), $2\frac{1}{2}$ cwt. superphosphate (30 per cent. soluble), and $\frac{1}{2}$ cwt. sulphate of potash (55 per cent. purity).

Manuring Grass Land (Univ. Coll. of North Wales, Bangor, Agric. Dept., Bull. IX., 1906).—An experiment to test the effect of manures on grass land was commenced in 1902, and various combinations were applied annually in 1903-5, but no manure was given in 1906. The weight of hay is given for the four years. The manures did not produce any large increase in the yield, though they undoubtedly effected considerable improvement in the herbage.

Another experiment, begun in 1904, was intended to compare the action of the manure sold as basic superphosphate with that of superphosphate and basic slag. Basic superphosphate is prepared from superphosphate by adding sufficient lime to give the whole an alkaline reaction. The phosphate obtained is not soluble in the same sense as superphosphate, but is in such a condition that it can be readily taken up by plants, if it is evenly distributed through the soil. The manufacturers urge that it will prove superior to superphosphate on land deficient in lime, and that where the soil contains considerable quantities of vegetable matter, or is affected with finger-and-toe, it is also to be preferred.

The result of the three years' trial showed that basic superphosphate is very similar in its action to superphosphate, and in this case, at any rate, decidedly inferior to basic slag. In previous years the action of basic superphosphate has been compared with that of basic slag and superphosphate as a manure for swedes, and Professor Winter remarks, "So far as we have been able to judge, its action is very similar to that of superphosphate, which can be purchased at a much lower price."

Manuring of Pasture with Basic Slag (Essex Education Com., Field Expts., 1906).—This experiment was intended to test the effect of a second application of basic slag. It is pointed out that when the use of basic slag has resulted in an increase of the leguminous herbage, and this herbage has flourished for a few years, the enrichment of the soil consequent upon the fixation of atmospheric nitrogen by the leguminous plants gives rise to a change in the herbage, and finer grasses begin to replace some of the leguminous plants. It might be assumed from this that a second application of slag at this stage would be unlikely to have a great effect. Two plots which received slag in 1901, however, were

again dressed at the rate of 6 cwt. per acre in 1906, and the results were very marked. Although the change was not so great as after the first dressing, yet there was a decided increase of clover plants. The full effect will be more apparent in the second year.

Effect of Various Qualities of Basic Slag (Essex Education Com., Field Expts., 1906).—It is stated that the experimental plots at two centres, upon which four grades of slag are being compared, continue to show appreciable and persistent differences. The yields up to the time of the report showed that the 35-38 per cent. grade gave the best result, there being very little difference between the 42-45 per cent. and 30-32 per cent. grades. The yield from the 22-26 per cent. grade was the lowest in each case.

Manuring of Meadow Hay (Cumberland and Westmorland Farm School, Annual Report, 1907).—Trial plots have been under experiment here for ten years. The practice has been to manure them every third year, and they were last manured in 1905. The crop of 1906 was exceptionally good, owing to the weather, and there was little difference in the yield from the plot which has had no manure for ten years, and the four plots receiving artificial manures. The plot receiving farmyard manure (10 tons), however, gave 15 cwt. per acre more than the unmanured plot.

Manuring Grass Land (Univ. Coll., Reading, Expts. at the College Farm, 1907).—An acre of old grass land has been divided into ten plots, and is treated annually with various manures to test the effect of the fertilisers on the quality and quantity of the herbage. The results are given for 1907.

Laying Down of Permanent Grass Land (Univ. Coll., Reading, Expts. at the College Farm, 1907).—In order to increase the amount of grass land on the College Farm, 22 acres were laid down with permanent grass in 1904, and the opportunity was taken to sow a series of eight one-acre plots with various mixtures of seeds, together with a duplicate series of half-acre plots. For permanent mixtures it is usually supposed to be best to sow seeds of the durable grasses enough to cover the ground to the extent of 60 per cent., and not to have more than 40 per cent. of the ground occupied by clovers and the shorter-lived grasses. If more of the clovers and short-lived grasses are added these tend to produce a large yield in the first few seasons, but they may endanger the permanence of the pasture by smothering out many of the more durable and finer grasses, and ultimately die out, leaving the ground more or less bare and open to the spread of weeds. To test these points systematic variations, which are given in the report, were made in the composition of the mixtures. A very similar experiment was started in 1906, in connection with another field, which was also put in permanent grass.

Formation of Permanent Pasture and the Herbage of Old Pastures (Camb. Univ. Dept. of Agric., Guide to Expts., 1907).—About 46 acres at Burgoyne's Farm were laid down to permanent pasture in 1901; the seed mixture used is given, and the effect of the subsequent manuring is described.

Another experiment in the formation of permanent pasture has been made at Abbotsley in Huntingdonshire, where eight different seed-mixtures were sown in 1900 on a field of poor clay soil, and subjected to four different manurial treatments. The land has been grazed since 1901, but in 1905 sub-plots of $\frac{1}{40}$ th of an acre each were fenced off and cut

for hay. Figures are given of the botanical composition of the herbage on each of the plots and sub-plots, and the general results showed how small may be the relationship between the seed-mixture and the pasture. Some of the results obtained were discussed in an article which appeared in this *Journal*, October, 1905, in which the unsatisfactory state of our knowledge of the herbage of pastures was pointed out, and it was decided to examine a number of permanent pastures for the purpose of getting information upon the following points : (1) the percentage of the surface occupied by different species; (2) the number of plants per square foot; (3) the density of the herbage; (4) variations in the proportions present of the same plant at different seasons of the year; (5) the chemical composition of the herbage at different seasons; (6) the chemical composition of the soil. A number of tables are given showing the results of the investigation. A summary was given in this *Journal*, March, 1908, p. 735.

Experiments on the laying down land to grass have also been carried out at the Suffolk County Council Experimental Station at Saxmundham since 1902, and tables are given showing the botanical composition of the hay crop in 1904 and 1906.

The effect of various manures on the hay crop and of basic slag on poor pasture land is also being tested at Saxmundham.

Improvement of Old Pasture (*Camb. Univ. Dept. of Agric., Guide to Expts.*, 1907).—The improvement of poor pasture is a subject to which the Cambridge Agricultural Department has given a good deal of attention in recent years. With the assistance of the Board of Agriculture, a field of 40 acres of poor grass land at Cransley, in Northamptonshire, has been rented for experimental purposes, as well as 16 acres at Hatley in Cambridgeshire, and by arrangement with the County Councils, experiments have been carried out in Essex and Norfolk. The experiments were all of the same type. Fields of poor pasture were divided up into three-acre plots, the plots were differently manured, and the effects of the manuring were ascertained by pasturing sheep upon the plots for from 16 to 20 weeks during the summer months. Sheep for the purpose were carefully selected in April or May, and after having been fasted for a night, were weighed and divided up into uniform lots. The fasting and weighing were repeated at the end of each month, and the total increase made by the sheep was taken as showing the improvement which had taken place in the pasture as the result of the manuring.

In all, except one, of these pasture experiments, the best results have been obtained from heavy dressings (10 cwt.) of basic slag. Manures containing potash, lime, or nitrogen, have not been found necessary in the early stages of the improvement, but at Cransley, after several years, both potash and lime are beginning to produce marked effects. It has been shown by these experiments that the improvement produced by phosphatic manures is partly indirect. Phosphatic manures bring about a great increase in the clovers, and the luxuriant clover crop, which springs up one or two years after manuring, improves the soil for grasses. In treating such poor pastures, therefore, the first aim must be to stimulate clovers as much as possible. After from two to four years the clovers begin to disappear, and the grasses should then receive attention.

The results of these experiments are given in tabular form, together with the figures of another series of experiments on manuring land for

hay, which have been in progress at Shenley since 1898, and at the University Farm since 1901. The same subject was dealt with at three other centres.

Improvement of Permanent Pasture (Journ. of the Bath and West and Southern Counties Soc., Fifth Series, Vol. II., 1907-8).—A short report is given on the experiments at Stockbridge, in Dorset, and Sampford Courtenay, in Devon, which have been in progress for a number of years. It is observed that the great benefit which these clay lands receive from an application of basic slag is still very apparent, even after six years. Two things are noticeable in these experiments, first, the great improvement caused by another lighter dressing of basic slag, and second, the still greater improvement caused by a dressing of good farmyard dung applied one or two years after the basic slag. In the latter case, the grasses seem to participate equally with the clovers in the improvement.

A report is also given on the results obtained in 1907 in the experiment which has been in progress for eight years at Sevington, near Alresford, Hants. Here, as in the experiments conducted by Cambridge University and by the Highland and Agricultural Society, which are referred to above, the effects of various forms of manuring are tested by feeding sheep upon the plots and comparing the increase obtained. This experiment is not yet concluded, but it may be observed that Plot 3, which received 10 cwt. basic slag in 1901, has given the best financial result over seven years, while Plot 4, which received 5 cwt. basic slag in 1901 and the same quantity again in 1904, takes the second place. Three other plots gave a greater increase in weight of mutton than Plot 4, but owing to the greater cost of the manures used, the net results were not so good.

Formation of Permanent Pasture (Univ. Coll. of N. Wales, Bangor, Agric. Dept., Bull. IX., 1906, and VI., 1907).—Experiments with four different mixtures of grass and clover seeds were commenced at nine centres in 1906. The weight of hay obtained in 1907 is given.

Manuring of Red Clover for Seed (Beds. C. C. Agric. Dept., Rept. on Demonstration Plots, 1907).—An experiment was commenced in 1906 to test the effect of manures on red clover, where the first-cut is made into hay, and second-cut left for seed. This was repeated in 1907, but owing to the wet autumn it was impossible to harvest the seed satisfactorily. The weight of the hay crop is given.

Permanent Red Clover (Harper-Adams Agric. Coll., Field Expts., 1907).—An experiment was commenced in 1906 to test a new strain of red clover, viz., Leighton's Inherited Permanent Red. It is claimed for this strain that it is more permanent than ordinary stocks of red clover. Three plots, each two acres in extent, were sown on barley in 1906. Two of these plots were sown with similar mixtures supplied by different seedsmen, but each containing 4 lb. of ordinary red clover; the third plot was sown with the same combination of seeds with 4 lb. per acre of the permanent clover. During the winter a good deal of the ordinary red clover died out, and when growth began in 1907, the plot receiving the permanent clover soon outstripped the other plots, and produced a remarkably heavy crop. The aftermath on this plot was nearly all clover, while that on the other plots contained but little clover, the plants having apparently spent themselves in flowering.

SALFORD CATTLE MARKET.

JOSEPH CLARKE.

The Salford Corporation Cattle Market is one of the largest cattle markets in the country. It covers 10½ acres of land, and contains 300 cattle and 1,100 sheep pens, sheds for 300 calves and 120 pigs, together with lairage accommodation for 800 cattle and 1,000 sheep. There is pen accommodation in the market for 3,500 cattle and 18,000 sheep.

The number of animals brought to the market is not, however, quite so large as was formerly the case. In 1880-1, for instance, 170,652 cattle and 612,785 sheep were shown, whereas in 1906-7 the numbers were 100,762 cattle and 508,193 sheep. These figures, however, exceed those of any other market in the United Kingdom, London not excepted.

Facilities of Transport.—Salford Market is well situated so far as the moving of animals to and from the market is concerned, being served by two of the largest live-stock stations in Great Britain, namely, Cross Lane Station on the London and North-Western Railway, and Windsor Bridge on the Lancashire and Yorkshire Railway, both of which are situated within 300 yards of the exits to the market. At Cross Lane Station it is possible to deal with 150 trucks for either discharging or loading simultaneously. At this station stock is dealt with coming from all parts of Scotland, Ireland, North Wales, the Southern and Eastern Counties, by the North-Western Railway; from Shropshire and Herefordshire and the West of England by the London and North-Western Railway and the Great Western Railway, and from the Eastern Counties and Lincolnshire by the Great Central Railway.

At Windsor Bridge there is accommodation for dealing with 140 trucks. This station is a convenient landing place for animals from the large feeding districts of Yorkshire, and also for stock coming from Ireland, via Fleetwood and Liverpool. It is used also for all stock passing from Scotland and the Eastern Counties by the Midland Railway.

As an illustration of the manner in which the market is served by the respective companies, it may be stated that it is possible to despatch animals from the Isle of Wight or from the interior of Ireland on the Monday, and have them delivered in time for business in the market on Tuesday. This is a very important point for butchers, as it enables them to purchase sheep and lambs in the very best condition off their home pastures. The Cheshire lines have also unloading accommodation at their Cornbrook sidings, which deal with stock from the Cheshire district generally, and there is also a direct service of boats between Dublin and Manchester by the Ship Canal.

Breeds and Weights of Cattle and Sheep.—About two-thirds of the cattle are Irish grass fed, ranging in weight from 26 to 36 scores. The most useful weight, and that in most demand by the butchers, is from 28 to 30 scores dead weight. Heavier weights than the above do not find a ready trade.

Irish cattle having a good percentage of lean meat are in request for the large manufacturing towns of Lancashire, where the populations, being chiefly employed in cotton or engineering works, or in the collieries, prefer lean meat rather than fat.

There are a few well-finished Herefords generally on sale, and these command the highest price for the suburbs of Manchester. The Welsh cattle shown are generally short of finish, but, being lean in cutting with a good weight of hide, find a fair demand for the Lancashire districts. There are very few Scotch cattle offered at this market now; as a rule they command better prices in their own country.

The fat cows and bulls are chiefly supplied from the dairy herds of Cheshire, Lancashire and Derbyshire, a few of the best bulls finding customers among the Jews, whilst the rougher sorts are transferred to the Lancashire towns.

The supplies of calves are principally from Cheshire and Lancashire, but owing to the scarcity of milk they are not of the very best quality.

Ireland takes the lead in the supply of sheep, about two-thirds coming from this source. There are few of the old Irish breed of sheep on offer, the majority being crossed to meet the growing demand for lighter weights. A useful cross is that of the Roscommon ewe and the Oxford Down ram, which produces good lean-cutting sheep, which, however, are too heavy for this market, good wethers weighing 100 to 110 lb. dead weight only making 7d. to 7½d. per lb., whilst lighter crosses, such as Downs and Blackfaced or Scotch, weighing 55 to 65 lb., make up to 8½d. per lb. The lambs of the same cross also meet a good demand.

There are a good number of clipped sheep shown from Lincolnshire and Yorkshire during the months of April and May. These are of good quality and generally average from 70 to 80 lb. per sheep, making from 7½d. to 8½d. per lb.

The Scotch supplies include all the light breeds of sheep. The Cheviot, on account of small joints and compactness and plumpness of carcase, makes the most per lb. of any sheep for Manchester trade, small shearlings last spring making from 10d. to 11d. per lb., weights 45 to 56 lb.

The following crosses also produce useful sheep for sale at this market:—(1) Cheviot ewe with Leicester ram, producing a good sheep with more size and weight, 54 to 64 lb., and prices 9½d. to 10½d. per lb. (2) Border Leicester ewes crossed with Oxford Down rams are good for early maturity of fat lambs, and command a ready sale. Weight, shearlings 60 to 70 lb.; prices 9d. to 9½d. per lb. (3) Greyfaced or Blackfaced ewe and Wensleydale ram produce a sound-fleshed sheep, containing a large percentage of lean meat of excellent quality, preferred by many butchers to that of any other breed. Weight 56 to 70 lb.; price 9d. to 9½d. per lb. The prices refer to last spring.

The numbers of Welsh sheep offered are small, chiefly ewes and four-year-old wethers, but the lamb supply has very much increased of late years. In the early season, following closely the South Country lambs, the small Welsh and Welsh crossed Shropshire Downs find a very ready sale, the high prices at that time of the year being very much in favour of the small carcase.

Up to the present time the weighbridge has not found much favour as an intermediary between buyer and seller on the live weight system, both buyers and sellers being much more in favour of trusting to their judgment to buy and sell by hand, their calculations being based on the weight of so many pounds per quarter.

There are a fair number of cattle sold at so much per lb. dead weight, sinking the offal in favour of the purchaser.

The number of buyers attending this market varies from 500 to 600, purchasers attending from all the principal towns of Lancashire, Cheshire, Derbyshire, and Yorkshire.

THE CORN MARKETS IN DECEMBER.

C. KAINS-JACKSON.

Inquiry for grain in the three working weeks before people began to go away for the Christmas holidays was below the average, and there was no effective resumption of trade on the four last days of the month. Thus the new year enters with every prospect of brisk trade, the stores in the hands of bakers and corn chandlers being decidedly small, while millers hold much smaller quantities of foreign wheat than is usually the case at this date. Some of them, however, are well stocked with English wheat. The importers of grain closed the old year with less wheat than usual in the port granaries, but they are overstocked to some degree with light and inferior oats and barley, largely Russian. The stores of maize are extremely small, so that the new crop supplies from the United States will not improbably be absorbed without causing any marked depression in prices during January. The November imports were much below the average, and those of December still more so. The cold weather on the 27th increased retail consumption, but did not affect any December exchanges. An exception was to be found in appearance in the price of Town Household Flour in London being raised 6d. per sack on the 30th, but this official quotation of the London Millers' Association is rather a herald of coming value than a record of business done. "Town Whites," as usual, accompanied the ordinary grade in its price change, keeping, also as customary, a distance of three shillings per sack in advance of average quality.

Wheat.--The price of English wheat for December will encourage or depress the grower accordingly as he compares it with the last three months, or with a whole year back. On the nearer comparison, 1s. to 1s. 4d. recovery, no negligible quantity, is shown. On the twelvemonth there is about a florin fall. This decline has been caused by the very free sales to millers. British wheat-growers seem to find it very difficult to refuse a *bond fide* cash offer of over thirty shillings per quarter, and millers, finding that foreign wheat was stiffly held, have been willing to pay for English produce 30s. at the lowest; at the highest, perhaps, 37s. per quarter. Foreign wheat declined during December 1s. to 1s. 6d. on Canadian, 9d. to 1s. on United States produce, the result very largely of price changes at New York, which on November 28th was paying 39s. 1d. for winter wheat, but on December 19th only 37s. 6d. per quarter. Before the new year there was a slight recovery, 1908 at New York closing with a 38s. quotation. Freights are amazingly low, and grain which costs 38s. at New York can be delivered on quay at Liverpool or into Tilbury Docks at 40s. per qr. Still 40s. is substantially above the price of English wheat, and no pressure upon values for the latter can be said in December to have come from the imported produce of North America. The Canadian surplus is clearly a large one, and

it is probable that holders are doing well to meet the views of buyers in this country. So fine is the milling quality of good Manitoba wheat that as soon as the price is on the tempting side of forty shillings buying becomes brisk. The value of other foreign sorts of wheat at the end of December was 40s. to 41s. for Australian, 38s. to 42s. for Russian, 39s. to 41s. for Indian, and 39s. to 40s. for Pacific. The Australian and Californian supplies will be seen to have a close correspondence, both of value in comparison with one another, and also within the staple, so to speak. The Russian quotations are very different, fully 4s. range being disclosed. Russia continues to suffer severe money losses through the slovenly manner in which a large proportion of shipments is made. At the beginning the buyer suffers, but in the long run the seller, for the price bid comes to include a very generous margin for the faults of the consignor. It may be remarked that the promise of the growing wheat in India is deemed sufficient to warrant the offer to ship in May at 37s. per 492 lb.

Flour..—Remark has already been made of the official rise in London of millers' quotations at the very end of the month. Cash terms at the end of December were 32s. for Town Whites, and 29s. for Town Households. These are the two main sorts of flour made in London. A West End loaf contains, as bakers affirm, more Town Whites than an East End loaf. This much may be allowed. In the absence of law or standard, hardly anything further can be said, but the good suburban loaf, that of the respectable residential outskirts of London, probably is a fair mixture of the two types. London also produces a Top Grade now at 33s. to 34s.; "Special Whites," which closed the year at 31s. for cash; "Extras," which made 30s.; and No. 2, which were quoted at 27s. 6d., and represent the lowest grade blended in a quality loaf. Country flour all through December poured into London to an extent which caused London millers some anxiety. London is now able to provide from the work in its own mills all the flour needed for its five million inhabitants. As the country sends up freely, and as flour comes in from abroad, so will depression result. On the other hand, the population is increasing for this same area at the rate of a thousand weekly, and the London mills have, therefore, only to hold their own for a moderate time, and the situation will rectify itself. Country flour at the end of the old year was offered in London at 27s. per sack for a good mixture of half English and half imported (Kansas or like winter wheat grade). For all-English straights 26s. was accepted. American flour was making 32s. for Minneapolis best, and the same price for the prime produce of the Canadian towns, Winnipeg, &c. Kansas flour touched 30s., but was for the most ranging from 28s. to 29s. Common but serviceable American of better nutritive value than colour made 26s. per sack. The demand for whole meal is good, 29s. per sack being paid. Rye flour costs 21s. to 22s. per sack for the best, and is worthy of attention.

Barley..—The average price of English barley for December showed a slight decline from November, but was practically unchanged from a year previously. The local averages have shown some strange variations, but the very great range in intrinsic quality, from the best malting worth 40s. per 448 lb., to the commonest feeding, offered at 24s. per 400 lb., is ample to account for all such differences, even when it is remembered that the official returns reduce all barley sales to a uniform

400 lb. Scotland, in December, shipped coastwise quite appreciable quantities of barley to London. This was not malting quality, but what is called "bold, chicken barley," worth 26s. to 27s. per 416 lb., which is its usual weight. Of imported barley the sort in predominant supply has been Russian. The shipments from the Euxine for December exceeded a million quarters. About a guinea per 400 lb. has been the price on British exchanges. Other arrivals of foreign barley have included fine Moravian at 34s., screened Ouchak at 38s., unscreened Anatolian at 34s., and brewing barley from North Pacific ports at 35s.; all these quotations are by market custom at 448 lb., and therefore look higher than they are. Persian barley at 20s., Casabianca at 21s. 6d., and Mogador at 24s., are sorts sold per 400 lb.

Oats.—The price of English oats for December showed no appreciable change from November last; imported sorts tended in buyers' favour. This, being due to general causes, has been dealt with in some introductory observations. For Russian sorts value at the end of December was as low as 14s. 6d. per 304 lb., that is, of course, for the very lowest kinds, whether from Black Sea or Baltic ports. White Sea oats have not fallen below 15s. 6d.; there will be no fresh arrivals before next July. Courland, and the whole region between St. Petersburg and the Prussian frontier, produces somewhat superior oats to those grown in Russia proper. These oats fetch 17s., even when the weight is only 304 lb., and 19s. is paid for 320 lb. descriptions. East Prussia grows very good oats, which go up to 20s. in price at Mark Lane. The quantity shipped, however, is never large, whereas it is the inferior kinds which La Plata, as well as Russia, produces in superabundant quantity. Argentine oats are quoted at about 15s. 6d. to 16s. per 304 lb. for the 1908 crop; that of 1909 is now being reaped, and is offered for March shipment at 14s. per 304 lb. The determination of Argentina to drive light Russian oats off the London market is apparent, and as neither kind clashes with English produce, a net gain to the importing country would appear to result. The cheap foreign oats gave us, at the end of 1908, some curious by-products, such as oat-husk meal at 65s. per ton, and oat husks themselves at 45s. per ton.

Maize.—The yield in the United States was given in the *Board of Agriculture Journal* for November (p. 701) at 2,642,687,000 bushels, this being the official "first" report of the Bureau of Statistics at Washington. Subsequent details confirm this early estimate, and in some quarters it is even held to be rather below the mark. The surplus available for export is therefore very large, and contracts are being made on a liberal scale for its shipment. The price asked at the end of December was 24s. 9d. per qr., at which rate the buyer could select his own month for shipment, January to April inclusive. The produce will be in full supply at Mark Lane from early in February, but the arrivals before that date will hardly be in very heavy bulk. The spot value at the end of December was 26s. to 26s. 6d. for American and Argentine, 26s. 6d. to 28s. for Russian and Roumanian maize. American during the year had touched 30s., and had been on sale at 24s., and although to make an average of these values at 27s. would be very empirical, it is probable that an average of sales at the 151 London markets of the year would work out at very closely that mean. The range in Argentine for 1908 was from 24s. to 28s.; it never was as scarce as American in the period of minimum supply. The depressing effect of the large supplies of American

for January, February and March shipment is, as has been already seen, to some degree reduced by the remarkable depletion in spot reserves. December imports were the smallest since 1902.

Pulse.—Split beans had a slow sale before Christmas, but a better inquiry manifested itself before the month was quite out. The sales in the split form are for a unit of 320 lb., too heavy for a sack and standing for a couple of 160 lb. bags. Buyers should note this. The price by this unit is 21s. to 22s.; for the higher price old beans should be procurable, the lower quotation representing new beans. Where unsplit, beans make about 33s. per 504 lb. Peas commanded at the end of December 35s. per 504 lb. for Maple and 32s. 6d. for Dun. Split peas are not sold by the 320 lb., like beans, but by the same unit as when unsplit. In the split form they have been making 47s. for yellow and 49s. for kiln-dried.

Oil Seeds.—All through 1908 oil seeds kept up well in price, and they closed with currencies ruling that should represent a good profit on production. Linseed at the two London markets after Christmas made 47s. for Russian with a 98 per cent. purity guarantee, 46s. for Calcutta, 50s. for Morocco, 45s. for fair average quality La Plata, and 50s. for Dutch. Rape seed has been quoted at 44s. per 416 lb. for 1909 shipment from India, the quality being that known as Ferozepore. Very little spot trade has been done, but a few tons of English have changed hands at 60s. per qr. Poppyseed at 50s. per qr. has been but little noticed. It is, however, rich in oil, and it is not soporific in its effect on cattle when made into cake. Cottonseed, at seven guineas per ton, closed the year with a stiff market.

Farm Seeds.—Business has increased in farm seeds, but prices for clover seed have fallen slightly owing to larger deliveries from farmers. Canada has continued to send us some excellent Alsyke, which Mark Lane does not leave long unsold. French Lucerne at 76s. to 77s. per cwt. has had only a small sale; the price is unusually high. Sainfoin has made 25s. to 27s. per qr., and has been in somewhat improved demand.

Minor Staples.—As soon as the weather turned to frost brewers' grains rose 1s. 3d. per ton. Dried ale grains advanced from 105s. to 106s. 3d. per ton, and other kinds in proportion. Oatmeal was in improved request, but at the close of the month £11 per ton cash still commanded Aberdeen. There was at the end of December a fair sale of feeding rice at 7s. per cwt. rough, and 9s. per cwt. cleaned.

THE LIVE AND DEAD MEAT TRADE IN DECEMBER.

A. T. MATTHEWS.

Fat Cattle.—After a long series of markets during the autumn at which the principal feature was the half-fed condition of the animals on offer, it was quite a relief, when December came in, to see the end of the grazing season and the first of the Christmas shows and markets. The first distinct improvement visible in the condition of cattle classed as Shorthorns at the Metropolitan market was on the last day of November, when some stall-fed cattle were on offer. On the 7th the

change was more marked, and Norfolk Shorthorns made up to 7d. per lb. for the first time since August 3rd. This advance was entirely owing to the better finish of the animals, and it would not be too much to say that there have been no real first quality Shorthorns at Islington during the four intervening months. On the same day the top price of Herefords was only 7d., and of Runts, 6½d., there being no improvement in their condition, but a few Polled Scots were sold at 7½d., and some good Devons at 7½d.

The Christmas markets may be said to have commenced at Ruthin, North Wales, on December 1st, where the numbers on offer were less than half those of last year. The quality, however, was excellent, and apart from prize-winners, the best Shorthorns made about 7d. per lb. This was a good beginning, and was followed by many similar events in various parts of the country. It is, of course, well known that the prices given for prize animals at Christmas shows are quite exceptional and bear little relation to the current market values, as they are frequently purchased by butchers for purposes of advertisement; but it may not be without interest to mention that at Corwen, in Wales, a champion beast fetched £29, and another at Denbigh, £30. The highest price at Dorchester was £33 10s., and at Hereford £29 15s. At Leeds a Shorthorn bullock weighing 16½ cwt. made the handsome figure of £52 10s., and at Aberdeen, His Majesty's Black Polled bullocks sold at £25 to £42 per head.

There is nothing of the nature of a show at the great Christmas market at Islington, which took place this year on December 14th, and there were no prize animals and no fancy prices. This event is therefore probably the safest guide to the current values of animals which have been well finished for the Christmas trade. There was a considerable falling off in the numbers of sheep compared to those of last year, but the total number of cattle was 2,600, against 2,630 in 1907, while the sheep fell from 10,210 to 6,880. The 300 Aberdeen Angus were fewer by about 150 than last year, and there was nothing remarkable in their weights or condition, but a marked absence of that overfeeding which was, in past years, carried to such excess. They were, however, of excellent quality, and the same may be said of the Shorthorns and Devons, but the Herefords and Welsh Runts were also very good. There was a brisk trade, and all were easily sold at prices much above those of recent ordinary markets, and also those of last year. Some few of the Aberdeens reached 8½d. per lb., but 8½d. was the current top price, against 7½d. in 1907. That of Herefords was 7½d. against 6½d.; Shorthorns, 7½d. against 6½d.; Devons, 8d. against 7½d., and Welsh Runts, 7½d. against 6½d. As compared with the low prices current in October, it is evident that liberal feeding for the Christmas market has been, this year, more profitable than usual.

On December 21st there were only 300 fat cattle at Islington, and these again sold well, allowing for some falling off in quality. Some Aberdeens made 8d. per lb., Herefords 7d., Shorthorns 7½d., and Runts 7d., but no Devons were present.

We now come to the last market of the year at Islington, which was held only three days after Christmas. Considering this fact, 980 head was a good muster, and they met an unexpectedly good demand. Buyers for the dead meat market attended early, and all were speedily cleared off. Top prices were 7½d. per lb. for Scots, 7½d. for Norfolk-fed Short-

horns, $6\frac{1}{4}$ d. for Welsh, and $7\frac{1}{2}$ d. for Devons. Of these last there were 100 present direct from their native county, which made a good show.

Fat Sheep.—The depression overhanging the mutton trade has given rise to much speculation as to its causes, but no explanation that the writer has hitherto seen put forward seems very satisfactory. The fall which took place in April came very suddenly, and has been followed by a uniformly bad trade through the summer and autumn, with very little, if any, general improvement in December. It is many years since good fresh killed mutton has sold as low as in the latter part of this year, when thousands of wether sheep have only realised 6d. per lb. For the purpose of comparison, however, we may take the values which have been current during December for the best small Down tegs, and these, roughly speaking, are only worth 8d. per lb., or 1d. less than last year at this time. At the first market at Islington in December there was a quotation of $8\frac{1}{4}$ d., but this was only for a comparatively few very small weights. At the Christmas market, notwithstanding the small supply, the demand was so weak that the market failed to clear, and nothing fetched more than 8d. per lb. There was a slight rally on the 21st, and the top quotation advanced $\frac{1}{2}$ d. per lb., but this was again lost on the 28th, with only 3,480 on offer. London prices for the very choicest small sheep have been a trifle higher than those of most of the country markets, only Dorchester, Derby, and Chichester occasionally exceeding them, but sheep weighing 80 lb. and upwards have sold, if anything, better in the country. The first quality of Downs were quoted at Hereford on the 16th as low as 7d. per lb., and $7\frac{1}{2}$ d. at Crewe on the 14th.

Fat Pigs.—The trade in bacon pigs and porkers has been irregular during December, but on the whole, values have remained low. A weakening tendency was observed at the beginning of the month, but prices, on the average, hardened a little during Christmas week. The factors' price to farmers for bacon pigs of small weights have been as low as 8s. 9d. per score, which seems to leave a wide margin for profit, in view of the scarcity on the market and high price of dried English bacon.

Veal Calves.—Very few calves are fed at this time of year in this country, and the demand is also small. The supply at Islington has been almost nominal during the month, and the few on offer have not been of very good quality. On the 7th the highest quotation was $7\frac{1}{2}$ d. per lb., and considerably higher prices were made in the large country markets. In that week, $8\frac{1}{4}$ d. was quoted at Newcastle, $8\frac{1}{2}$ d. at Wakefield and Salford, and 8d. at eight other markets, while 9d. was reached at Salford on the 15th.

Carcase Beef.—The scarcity of best quality cattle in the live-stock markets, which has been such a prominent feature, has prevailed with equal force in the dead-meat market, and has extended to the supplies of foreign to quite the same extent. Until the week before Christmas the value of Scotch long sides remained level at $6\frac{1}{2}$ d. to $6\frac{3}{4}$ d. per lb., or fully $\frac{1}{2}$ d. per lb. more than the best English. The chief reason for this great difference has been that Scotch graziers have had a better season than the English, and they have also steadily sent consignments of their best quality, while the few really good beasts which have been brought out in England this year have been slaughtered in the country. There has been an abundance of beef in the dead-meat markets, but a very large proportion of the foreign supplies has been of second and

third quality. On some days it has been hard to find any prime sides at all, either of port-killed or chilled, and buyers have been compelled to content themselves with second quality. It ought to be understood that vast quantities of beef and other meat are always being sold at the Central and Leadenhall markets, the prices of which never reach the official records. The grades of quality and values are too many to particularise, and thus many readers may scarcely realise the low rates at which inferior sorts are sold; take, for instance, the prices recently made for Canadian ranch beef, killed at the port of landing: on December 2nd, large supplies of this class of beef were sold at 4½d. per lb., and again on the 16th at 4½d.

The fluctuations in chilled beef have been quite eccentric during the month. On the 2nd, Argentine was fetching 4d. per lb.; on the 9th it rose to 5d., falling again to 3½d. on the 16th. On the 23rd it was 5½d., and on the 30th it declined to 5d. These prices refer to the best hind-quarters only, forequarters on the last-named day being worth 3½d. per lb. The transactions in frozen beef from New Zealand have been very small.

Carcase Mutton.—The supplies of Continental mutton have continued undiminished, and have had a very great effect on the values of home produce. Scotch and English carcases have been sold with difficulty at prices out of proportion even to the low ones ruling in the live-stock markets, the difference often being as much as 1½d. to 2d. per lb., which is a very wide margin for the offal. So far as the London dead-meat market is concerned, this would seem to be the direct effect of the severe competition of fresh-killed mutton from the Continent. The maximum price of best Scotch mutton during the month has been 6½d. per lb., except in the week before Christmas, when it rose to 6¾d. The lowest point touched was 6d., on the 16th. Approximately, the price of English has been ½d. per lb. less than that of Scotch. Continental carcases were making as much as English up to the second week in December, but since that date the latter has been fetching from ½d. to 1d. per lb. more. West country lamb has been very sparingly offered, and the small quantity coming met with little inquiry. On December 30th, however, a fair number of half-bred Dorset carcases were exposed in the Central Market, and sold slowly at about 10d. per lb.

Veal has been a very poor trade during the month, and on the 16th it was only worth 6d. to 6½d. per lb., rising at Christmas to 8d. for exceptional quality. Pork has fluctuated considerably, varying from 5½d. to 6½d. for best small pigs.

Wool.—There has been a decided improvement in the tone of the wool trade, and values have an upward tendency owing to a good consumptive demand rather than to speculative purchases. The London sales of Colonial wool, which closed on the 12th, went off with great spirit, and prices of cross-breds advanced from 15 to 20 per cent. on those of the October series. Should this movement continue, as it is expected to do, it must have a beneficial effect on the trade for both fat and store sheep, a large proportion of the teg wool being sold on the sheep's backs during the first months of the year.

Store Stock.—The trade for dairy cows has, on the whole, continued good, and prices have been very steady, but in this branch of store stock there is a very wide range of quality and values, wider, indeed, than it is possible to show in tabulated market returns. The London market

for dairy cows, though far smaller than it used to be, still attracts a fairly representative supply, and sometimes much higher prices are made than can be judiciously quoted. At any market during December a moderately good cow sold readily at £20 to £23, but occasionally as much as £27 was realised for specially good cows with fine udders, and that without the calf. With regard to dry store cattle and sheep there is very little to report, as comparatively few change hands during December. At great store-stock markets, such as Norwich and Shrewsbury, good store cattle have found plenty of buyers at full prices, and as much as 33s. 9d. per live cwt. has been paid for Shorthorn bullocks. The demand for store sheep has continued very restricted.

THE PROVISION TRADE IN DECEMBER.

HEDLEY STEVENS.

Bacon..—During the past month, trading on the whole has shown an improvement, although the Christmas demand for both bacon and hams was disappointing. Orders were general, but small in amount, buyers continuing their hand to mouth policy. Irish bacon was offered freely early in the month at prices which secured business in competition with Danish. The latter was at times somewhat below the usual standard of quality, and arrivals being large, prices were reduced in the buyers' favour.

Canadian bacon continues to arrive in small quantities, with a preponderance of light weights. The packers are continuing to sustain serious losses on account of the low prices realised for their produce, as hogs are still dear in Canada owing to their scarcity. This industry is reported to be in a critical position, as Danish bacon is such a formidable rival in this country, the Danes apparently being able to dispose of their produce in the English markets at prices which have for some time past shown losses to the Canadian packers of from 3s. to 5s. per cwt.

Prices of hogs in the United States remain at a high level in spite of large arrivals. Stocks of cured meats are large at all points, and with the lower prices on the English markets, the home buyers refuse to contract except to a very small extent, as, in their opinion, the Americans will have to reduce their ideas of value. Up to 12th December, packing for the winter season in Chicago alone showed an increase of 494,000 hogs, as compared with the same time last year. Hams were cheaper, especially towards the end of the month, which has resulted in a larger consumption.

There has been a good demand for English bacon throughout the month, and prices for English pigs have been about the same as last year. There are fewer pigs now on offer in the country, and the prospects are good for breeders, who are likely to obtain better prices for some time to come, unless the imports from Denmark should reach the level of the early months of last year (considerably above the normal), which would again reduce the prices obtainable for English and Irish bacon.

Cheese..—The demand during the past month has again been disappointing, with prices showing only slight variations, and these chiefly

in the buyers' favour. The prices realised for imported lots were very unsatisfactory to merchants, resulting either in a loss or only just covering the cost. English farmers continued to make cheese during the mild open weather of the first three weeks of the month. In the West of England a large number of Caerphillies have been on offer, but the quality has been more or less irregular, and the prices show a wide range, some of medium quality at Highbridge market being sold as low as 30s. to 35s. per cwt.

Very little business has been done in Canadian cheese, the holders in Canada preferring to keep their stocks for better prices, which, in their opinion, will be realised early in the New Year. Arrivals from New Zealand have been moderate, but there are some large shipments now on passage. The shipments from Montreal for the season of navigation in 1908 were 1,785,696 cheese, against 1,973,417 in the previous season. Stocks of Canadian at the end of the month, at the three principal distributing centres (London, Bristol, and Liverpool), amounted to 368,000 cheese, against 350,000 at the same time last year, and 459,000 two years ago.

Butter.—The prevalence of mild weather during most of the month, with large imports and a larger home make than usual for the time of year, caused buyers to operate very sparingly, and prices generally were in their favour. The colder weather at the end of the month, with consequently improved demand, caused prices to harden, and some merchants now look for a steady improvement in prices. Some large shipments are now on passage from New Zealand and Australia, but the quantities are not excessive for the time of year. The shipments from Canada and the United States for the month were almost nil, as their home prices are above a competition basis. Shipments for the season of navigation from Montreal for 1908 were 93,416 packages, against 66,773 for the season 1907.

Eggs.—There has been a fair trade throughout the month, and at no time has there been any accumulation of imported parcels, so that all lots have been cleared in a fresh condition. After the Christmas demand was filled, prices eased somewhat, but the trade generally has been healthy. The mild weather caused a fair supply of English to be on offer for the time of year.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND
in the Month of December, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—				
Cattle :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Polled Scots	8 5	7 10	40 5	36 7
Herefords	8 2	7 5	—	—
Shorthorns	8 2	7 5	39 2	35 7
Devons	8 6	7 9	—	—
Veal Calves	per lb.* d.	per lb.* d.	per lb.* d.	per lb.* d.
	8	7½	8½	6½
Sheep :—				
Downs	7½	7	—	—
Longwools	7½	6½	—	—
Cheviots	7½	7½	7½	7
Black-faced	7½	6½	7½	6½
Cross-breds	7½	7	8	7
Pigs :—	per stone.*	per stone.*	per stone.*	per stone.*
Bacon Pigs	s. d. 6 2	s. d. 5 8	s. d. 6 5	s. d. 5 8
Porkers	6 9	6 3	6 10	6 1
LEAN STOCK :—				
Milking Cows :—	per head.	per head.	per head.	per head.
Shorthorns—In Milk	£ s. 21 19	£ s. 18 8	£ s. 22 15	£ s. 17 13
" —Calvers...	21 17	18 6	19 16	17 7
Other Breeds—in Milk	19 2	16 9	20 4	16 12
" —Calvers	15 10	12 15	20 9	16 6
Calves for Rearing	2 4	1 15	2 7	1 14
Store Cattle :—				
Shorthorns—Yearlings	10 9	9 4	10 3	7 19
" —Two-year-olds... . .	14 12	12 17	14 0	11 18
" —Three-year-olds	16 13	14 19	16 5	—
Polled Scots—Two-year-olds	—	—	15 17	12 2
Herefords — "	15 10	13 11	—	—
Devons — "	14 13	13 18	—	—
Store Sheep :—				
Hoggs, Hoggets, Tegs, and Lambs—	s. d.	s. d.	s. d.	s. d.
Downs or Longwools	37 7	31 8	—	—
Scotch Cross-breds	—	—	29 3	23 2
Store Pigs :—				
Under 4 months	21 10	15 6	20 0	16 7

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in
ENGLAND and SCOTLAND in the Month of December, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birming-ham.	Man-chester.	Liver-pool.	Glas-gow.	Edin-burgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English ...	1st	56 6	53 6	51 6	—	61 0*	58 0*
	2nd	52 6	49 0	46 6	—	53 0*	49 6*
Cow and Bull ...	1st	42 0	46 0	43 6	39 6	44 0	42 6
	2nd	32 6	42 0	38 6	35 0	33 0	37 6
U.S.A. and Cana-dian :—							
Port Killed ...	1st	57 6	50 0	51 6	51 6	52 6	52 6
	2nd	51 6	44 0	45 0	47 0	46 0	46 6
Argentine Frozen—							
Hind Quarters ...	1st	33 0	33 6	33 0	32 6	32 6	33 0
Fore " ...	1st	29 6	29 0	28 0	28 0	28 0	30 0
Argentine Chilled—							
Hind Quarters ...	1st	43 6	41 6	38 6	38 0	39 6	43 0
Fore " ...	1st	30 0	31 6	31 6	31 0	32 6	33 0
American Chilled—							
Hind Quarters—	1st	58 0	56 0	55 0	55 0	52 0	57 0
Fore " ...	1st	36 0	36 6	35 6	35 6	35 0	38 6
VEAL :—							
British ...	1st	63 6	63 0	70 0	74 0	—	—
	2nd	59 0	55 0	65 6	68 6	—	—
Foreign ...	1st	63 6	—	—	—	—	64 6
MUTTON :—							
Scotch ...	1st	60 0	—	66 6	64 6	65 6	56 6
	2nd	55 6	—	61 6	59 6	47 6	46 0
English ...	1st	57 6	65 6	61 0	60 0	—	—
	2nd	53 0	53 6	56 6	55 6	—	—
U.S.A. and Cana-dian—							
Port killed ...	1st	—	58 6	—	50 0	—	—
Argentine Frozen ...	1st	32 6	32 6	32 6	32 0	—	32 0
Australian " ...	1st	31 0	31 6	29 6	29 0	—	—
New Zealand " ...	1st	37 6	—	—	—	—	—
LAMB :—							
British ...	1st	—	—	—	—	—	—
	2nd	—	—	—	—	—	—
New Zealand ...	1st	52 6	54 0	50 6	51 0	54 6	—
Australian ...	1st	47 0	46 0	44 6	45 0	—	—
Argentine ...	1st	44 6	46 0	45 6	46 6	—	—
PORK :—							
British ...	1st	56 0	59 6	60 0	61 6	54 6	55 0
	2nd	50 6	54 6	56 0	56 6	52 0	46 0
Foreign ...	1st	53 0	55 6	54 6	54 6	—	—

* Scotch.

AVERAGE PRICES of British Corn per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1906, 1907 and 1908.

Weeks ended (in 1908).	WHEAT.			BARLEY.			OATS.		
	1906.	1907.	1908.	1906.	1907.	1908.	1906.	1907.	1908.
Jan. 4 ...	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
" 11 ...	28 4	26 0	35 1	24 6	23 11	26 9	18 2	17 3	18 4
" 18 ...	28 6	26 1	35 2	24 8	24 2	26 9	18 4	17 4	18 3
" 25 ...	28 5	26 1	35 5	24 11	24 1	27 1	18 4	17 5	18 5
Feb. 1 ...	28 7	26 2	35 6	25 1	24 5	26 11	18 7	17 5	18 5
" 8 ...	28 10	26 3	35 0	25 1	24 4	26 11	18 10	17 7	18 4
" 15 ...	28 11	26 7	33 1	25 6	24 1	26 9	19 0	17 7	18 0
" 22 ...	28 10	26 10	32 6	25 4	24 2	26 5	19 0	17 9	17 11
" 29 ...	28 8	26 9	30 11	25 0	24 2	26 3	19 0	17 9	17 8
Mar. 7 ...	28 5	26 8	30 5	25 1	23 11	26 1	18 8	17 11	17 8
" 14 ...	28 5	26 10	31 3	24 8	24 2	26 0	18 10	18 0	17 10
" 21 ...	28 4	26 10	31 7	24 4	24 0	26 2	18 8	18 1	17 11
" 28 ...	28 3	26 8	31 4	24 5	23 9	25 10	18 11	18 2	17 10
Apl. 4 ...	28 7	26 9	31 3	24 2	24 3	25 5	18 11	18 3	17 9
" 11 ...	28 11	26 8	31 2	24 4	23 9	25 10	19 4	18 6	17 7
" 18 ...	29 4	26 8	30 11	24 0	23 3	26 1	19 1	18 7	17 7
" 25 ...	29 6	26 10	30 10	24 0	23 3	25 5	19 6	18 9	17 9
May 2 ...	29 10	27 0	31 6	23 10	23 6	25 8	19 9	19 3	18 0
" 9 ...	30 1	27 6	32 4	24 1	24 0	25 5	20 0	19 7	18 4
" 16 ...	30 3	28 4	33 1	23 10	23 10	24 9	20 1	20 1	18 7
" 23 ...	30 4	29 7	33 8	24 2	24 3	25 9	20 2	20 5	18 10
" 30 ...	30 4	31 4	33 5	22 10	24 0	24 6	20 5	20 8	18 8
June 6 ...	30 3	32 0	33 1	23 4	24 7	25 10	19 11	20 7	18 4
" 13 ...	30 4	31 10	32 7	23 6	24 7	24 5	20 2	20 11	18 4
" 20 ...	30 5	31 4	32 0	22 10	24 11	24 2	20 2	20 9	18 5
" 27 ...	30 3	31 2	31 5	24 3	24 6	24 0	20 1	20 8	18 7
July 4 ...	30 2	31 3	30 11	23 0	24 8	23 11	20 2	20 11	18 7
" 11 ...	30 5	32 0	30 5	23 8	24 10	24 4	20 4	20 11	18 5
" 18 ...	30 3	32 6	30 7	23 2	24 6	23 1	20 5	21 1	18 5
" 25 ...	30 5	32 11	31 5	22 4	27 3	26 5	20 2	20 8	18 6
Aug. 1 ...	30 9	33 2	31 10	22 1	26 1	24 4	19 3	21 2	18 7
" 8 ...	30 5	33 5	31 6	23 0	26 6	23 1	17 11	21 3	18 9
" 15 ...	29 0	33 6	31 6	24 2	25 9	23 10	17 0	20 4	18 1
" 22 ...	27 9	33 7	31 2	25 0	25 0	24 5	16 10	19 8	17 10
" 29 ...	26 9	33 10	30 10	24 3	24 2	24 5	16 6	18 11	17 1
Sept. 5 ...	26 4	31 11	30 10	24 9	24 2	25 5	16 3	17 7	17 3
" 12 ...	25 11	31 4	31 5	24 3	24 4	25 11	16 1	17 6	17 6
" 19 ...	25 9	31 5	31 7	24 3	25 0	26 0	16 0	17 6	17 3
" 26 ...	25 9	31 8	31 5	24 8	25 3	26 8	16 2	17 8	17 2
Oct. 3 ...	26 1	32 6	31 7	25 0	25 5	26 11	16 3	17 9	17 2
" 10 ...	26 3	33 3	31 5	25 3	25 9	27 5	16 7	17 11	17 0
" 17 ...	26 6	34 4	31 2	24 10	26 3	27 6	16 8	18 0	17 0
" 24 ...	26 7	35 9	30 11	24 10	27 2	27 5	16 10	18 7	16 11
" 31 ...	26 7	36 3	30 8	24 8	27 7	27 5	16 11	18 10	16 11
Nov. 7 ...	26 6	35 10	30 11	24 8	27 8	27 6	17 1	18 10	17 0
" 14 ...	26 4	35 1	31 2	24 4	27 8	27 4	17 2	18 8	17 0
" 21 ...	26 3	34 7	31 10	24 1	27 5	27 3	17 3	18 9	17 3
" 28 ...	26 1	34 7	32 3	24 1	27 5	27 2	17 2	18 7	17 5
Dec. 5 ...	26 1	34 7	32 7	24 1	27 1	27 2	17 4	18 6	17 4
" 12 ...	26 1	34 8	32 8	23 11	27 0	27 0	17 3	18 5	17 4
" 19 ...	26 3	34 9	32 9	24 3	27 1	26 9	17 3	18 3	17 3
" 26 ...	26 0	34 6	32 2	24 1	26 10	26 8	17 3	18 0	17 2

NOTE.—Returns of purchase by weight or weighed measure are converted to Imperial Bushels at the following rates: Wheat, 60 lb.; Barley, 50 lb.; Oats, 39 lb. per Imperial Bushel.

CORN PRICES:—ANNUAL AVERAGES.

AVERAGE PRICES of British Corn per Quarter of 8 Imperial Bushels, computed from the Weekly Averages of Corn Returns from the Returning Markets, together with the QUANTITIES returned as sold at such Markets during each of the Years 1902 to 1908.

YEARS.	PRICES.			QUANTITIES.		
	Wheat.	Barley.	Oats.	Wheat.	Barley.	Oats.
				s.	d.	s.
1902...	28	1	25 8	20	2	Quarters.
1903...	26	9	22 8	17	2	2,247,937
1904...	28	4	22 4	16	4	2,783,424
1905...	29	8	24 4	17	4	2,296,723
1906...	28	3	24 2	18	4	2,138,142
1907...	30	7	25 1	18	10	2,467,551
1908...	32	0	25 10	17	10	2,875,749
						3,437,176
						2,684,101
						3,210,995
						2,722,847
						3,317,521
						3,293,506
						3,293,916
						831,285
						1,049,995
						1,316,516
						1,073,611
						1,011,931
						1,374,260
						1,304,223

AVERAGE VALUE per IMPERIAL QUARTER of WHEAT IMPORTED into the UNITED KINGDOM from the under-mentioned Foreign Countries and British Possessions in the years 1906, 1907, and 1908.

Countries from which Exported.	Average Value per Imperial Quarter.		
	1906.	1907.	1908.
Argentine Republic	s. d.	s. d.	s. d.
Chile	29 10	31 6	35 6
Germany	—	36 8	35 1
Bulgaria	27 5	25 0	33 7
Roumania	28 11	30 2	38 5
Russia	29 10	32 8	38 2
Turkey	28 11	31 3	36 10
U.S. of America { Atlantic ...	30 7	33 9	36 3
Pacific ...	30 11	31 9	36 1
India, British	29 4	33 9	37 8
North America, British ...	30 8	34 1	35 1
Australia	31 2	33 8	37 7
New Zealand	32 2	—	—

AVERAGE PRICES of **Wheat**, **Barley**, and **Oats** per Imperial Quarter in **FRANCE**, **BELGIUM**, and **GERMANY**, and at **PARIS**, **BERLIN**, and **BRESLAU**.

	WHEAT.		BARLEY.		OATS.	
	1907.	1908.	1907.	1908.	1907.	1908.
France :			s. d.	s. d.	s. d.	s. d.
November	40 2	38 4	25 11	25 9	20 1	20 0
December	39 6	38 3	25 11	25 10	20 1	20 0
Paris :			s. d.	s. d.	s. d.	s. d.
November	38 5	39 4	26 2	25 0	19 0	20 10
December	38 5	39 6	26 2	23 3	18 11	20 7
Belgium :			s. d.	s. d.	s. d.	s. d.
October	36 7	34 3	27 4	25 3	21 3	19 11
November	35 2	33 8	27 0	25 1	21 6	19 11
Germany :			s. d.	s. d.	s. d.	s. d.
October	48 9	42 1	32 4	31 1	24 4	22 2
November	48 5	41 10	32 2	31 0	24 4	21 11
Berlin :			s. d.	s. d.	s. d.	s. d.
October	48 11	43 10	—	—	24 2	22 11
November	48 5	44 3	—	—	24 7	23 0
Breslau :			s. d.	s. d.	s. d.	s. d.
October	47 7	41 3	31 6 (brewing)	30 8 (brewing)	22 2	21 1
November	47 4	40 11	26 8 (other)	26 0 (other)	22 2	21 1
			32 6 (brewing)	31 6 (brewing)		
			27 5 (other)	26 0 (other)		

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets. The mark is now taken as equal to 11·8d., and the German prices for the former year have been recalculated on this basis.

AVERAGE PRICES of **British Wheat**, **Barley**, and **Oats** at certain Markets during the Month of December, 1907 and 1908.

	WHEAT.		BARLEY.		OATS.	
	1907.	1908.	1907.	1908.	1907.	1908.
London ..	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
...	35 6	33 10	26 8	26 7	19 4	18 6
Norwich ..	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
...	34 10	32 8	27 3	26 5	18 3	17 3
Peterborough ..	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
...	34 3	31 10	26 3	26 0	17 10	17 0
Lincoln ..	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
...	34 1	31 10	26 9	27 0	17 7	17 2
Doncaster ..	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
...	33 11	32 2	26 11	27 3	17 11	17 2
Salisbury ..	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
...	34 5	32 8	26 5	26 11	18 1	16 10

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of December, 1908.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Bristol.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
BUTTER :—			s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
British ..	per 12 lb.	per 12 lb.	15 0	13 3	14 6	13 6	—	—
Irish Creamery ..	per cwt.	per cwt.	114 6	111 0	117 0	114 0	111 0	107 0
," Factory ..	108 0	101 0	108 6	98 6	—	103 6	96 6	110 0
Danish ..	116 6	113 6	—	—	—	116 0	113 0	114 6
Russian ..	105 0	102 0	109 6	99 6	107 0	102 0	106 0	100 0
Canadian ..	—	—	112 6	107 0	108 6	105 6	—	—
New Zealand ..	113 0	110 0	116 0	110 6	113 6	111 0	112 0	—
CHEESE :—								
British—								
Cheddar ...	80 0	67 0	74 6	62 0	75 0	70 0	64 0	60 0
Cheddar ...	120 lb.	120 lb.	—	—	120 lb.	120 lb.	—	—
Cheshire ...	81 0	65 0	—	—	75 0	65 0	—	—
Canadian ...	per cwt.	per cwt.	61 0	61 0	58 6	60 6	61 0	59 0
BACON :—								
Irish ...	58 0	53 6	58 6	55 0	56 6	52 6	65 0	58 6
Canadian ...	52 0	50 6	52 0	48 6	50 6	46 6	52 0	50 0
HAMS :—								
Cumberland ...	105 6	94 0	—	—	—	—	—	—
Irish	107 6	99 6	—	—	—	—	94 0	82 6
American ..	—	—	—	—	—	—	—	—
(long cut) ...	51 0	47 6	48 6	45 6	48 0	42 6	49 6	47 0
EGGS :—	per 120.	per 120.						
British ...	20 5	20 0	17 6	15 0	—	—	15 7	13 2
Irish	17 2	14 8	14 4	12 8	15 6	13 5	15 7	13 1
Danish ...	17 4	15 4	—	—	—	—	—	—
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Langworthy ...	75 0	65 0	75 0	65 0	86 6	76 6	46 0	41 6
Scottish ..	—	—	—	—	—	—	—	—
Triumphs ...	60 0	50 0	65 0	55 6	41 6	36 6	—	—
Up-to-Date ...	62 0	51 0	60 0	50 0	41 6	36 6	40 0	37 6
HAY :—								
Clover ..	86 6	72 0	72 6	—	85 0	62 6	67 0	62 0
Meadow ..	71 0	55 6	65 0	—	—	—	54 6	49 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER OF OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	DECEMBER.		12 MONTHS ENDED DECEMBER.	
	1908.	1907.	1908.	1907.
Swine-Fever: —				
Outbreaks	132	107	2,067	2,336
Swine Slaughtered as diseased or exposed to infection ...	1,392	591	14,096	11,275
Anthrax: —				
Outbreaks	92	96	1,106	1,084
Animals attacked	108	129	1,423	1,456
Foot-and-Mouth Disease: —				
Outbreaks	—	—	3	—
Animals attacked	—	—	112	—
Glanders (including Farcy): —				
Outbreaks	43	60	785	854
Animals attacked	104	126	2,421	1,921
Sheep-Scab: —				
Outbreaks	117	211	849	751

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	DECEMBER.		12 MONTHS ENDED DECEMBER.	
	1908.	1907.	1908.	1907.
Swine-Fever: —				
Outbreaks	4	17	159	161
Swine Slaughtered as diseased or exposed to infection ...	62	157	3,625	2,789
Anthrax: —				
Outbreaks	I	—	8	3
Animals attacked	I	—	II	5
Glanders (including Farcy): —				
Outbreaks	—	I	—	6
Animals attacked	—	I	—	11
Sheep-Scab: —				
Outbreaks	51	86	384	326

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Cultivation and Marketing of Maize; Fertility of Acid Soils; The Breeding of Plants suitable for Growth in Alkaline Soils.

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Über Kropfmaserbildung am Apfelbaum, *J. Jaeger*.

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[*Note*.—The receipt of annual publications of foreign agricultural and other departments, experiment stations and societies is not noted in the monthly list of additions to the Library, but a list of those publications, which are regularly received, will be published at a later date.]

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Bureau of Animal Industry.—Circ. 133. Report and Recommendations regarding Veterinary Colleges in the United States. (13 pp.) Bull. 105. Varieties of Cheese. (72 pp.) Washington.

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THE JOURNAL OF THE BOARD OF AGRICULTURE.

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FEBRUARY, 1909.

FURTHER REPORT ON A DISEASE OF BEES IN THE ISLE OF WIGHT.*

WALTER MALDEN, M.A., M.D.

Pathological Laboratory, Cambridge

History of the Disease.—The disease was apparently first observed in the South-Eastern part of the Island, somewhere in the neighbourhood of Wroxall, in the summer of 1904. During the year 1906 it spread very rapidly, and in the spring of 1907 was prevalent over nearly the whole of the Island. At this time Mr. Imms visited the Island, and ascertained that the disease had been or was present at Bembridge, Blackwater, Bonchurch, Chillementon, Freshwater, Great Whitcombe, Hampstead, Newport, Porchfield, Ryde, Shanklin, Shalfleet, Sheat, St. Helen's, Thorley, Ventnor, Wellow, Wroxall, Yafford, and Yarmouth. He especially mentions that the disease had not been noticed at Cowes or Norton. In regard to the losses sustained through the disease, he observes that "In almost all the cases I have personally investigated, the disease was found to be so prevalent as to render it practically an impossibility to keep healthy stock for twelve months."

* A Report giving the result of an investigation by Mr. A. D. Imms, B.A., M.Sc., of Christ's College, Cambridge, into the nature and cause of a serious disease which prevailed among bees in the Isle of Wight was published in this Journal, vol. xiv. No. 3, June, 1907. As Mr. Imms was unable to continue the investigation, the Board of Agriculture and Fisheries obtained the assistance of Dr. W. Malden, of the Pathological Laboratory, Cambridge, and Dr. Malden has now furnished the Board with a report on the further investigations which have been made.

Early in May, 1908, I went to the Island and interviewed the bee-keepers and inspected their stocks. The following places were visited :—Alum Bay, Appuldurcombe, Arreton, Bembridge, Brading, Branstone, Binstead, Carisbrooke, Cowes, Freshwater, Gurnard, Hillway, Nettlestone, Newport, Northwood, Norton, Parkhurst, Porchfield, Ryde, Sandown, Shanklin, Steyne, St. Helen's, Thorley, Totland, Wootton, Wroxall, Yarmouth, and Yaverland.

As a result of this investigation it was ascertained that almost all, if not all, the affected stocks had perished, and in consequence there did not appear to be any diseased stocks left on the Island. Since the previous year the disease had reached Cowes and Norton, and had destroyed many stocks in both places. Although the disease had apparently quite died out in the early part of May, it was still present at the beginning of the year, the last stock to be affected being one at Bembridge, which perished about the end of April. Previous to this, in March and early April, there were several diseased stocks in different parts of the Island. After a short period of apparent complete absence, the disease appeared again about the middle of June, 1908.

In a recent letter, dated 15th October, 1908, Mr. H. M. Cooper says that "most of the old Island strains that were left in the spring seem to have since died."

Symptoms of the Disease.—The disease seems to be confined to adult bees, the brood remaining unaffected and retaining its normal appearance. The earliest sign that bee-keepers have noticed is an apparent disinclination on the part of the bees to do any work. They fly about in an apparently aimless manner, and do not gather stores. Later they gradually lose their power of flight, being often unable to fly more than a few yards without alighting. As the disease progresses, the bees can only fly a few feet from the hive, and then drop and crawl about aimlessly on the ground. They are often to be seen crawling up grass stems, or up the supports of the hive, where they remain until they fall back to the earth from sheer weakness, and soon afterwards die. Some bee-keepers assert that the abdomens of the affected bees look darker than normal, and have a greasy or shiny appearance. Others, though on the look-out for this

symptom, have not noticed it. A considerable proportion of the diseased bees have swollen abdomens, which they are unable to extend fully. The terminal segments droop, and are partly flexed downwards. According to some bee-keepers, this is so marked that they are able to diagnose the disease by the characteristic attitude of the bees on the combs before any dead ones are found outside the hives. It has been stated that the diseased bees lose their power of stinging. It has been clearly proved, however, that these bees can sting, but owing to their sluggish and otherwise sickly condition are disinclined to do so. The wings are often dislocated, but this is not invariably the case. In a badly infected stock great numbers of bees are to be seen crawling over the ground in front of the hives, frequently massed together in little clusters, while others remain on the alighting board. If the hives be opened, numbers of diseased individuals will often be met with inside.

In winter and in the early spring the diseased bees void their excrement on the floor, walls, and alighting boards of their hives, the dried fæces taking the form of a streak of dirty brown material. In summer this condition is not noticed. All observers are agreed in stating that the foragers are the earliest to become affected, and many have thought that robbers which enter infected hives are the first to be attacked. In hives which have been completely destroyed the last remnant of the colony is generally found grouped around the queen. The latter probably dies from want of attention and not from the disease.

Secondary Effects of the Disease.—Hives attacked by the disease are liable to "chilled brood," which kills off large numbers of the young and developing generation. The weakened bees are unable to withstand the onslaughts of robbers, and the latter were often in evidence around infested hives, while the destruction of a diseased colony is further hastened by the Wax Moth, which soon gains an entrance into a feebly defended hive.

Mortality and Influence of Season.—The mortality caused by the disease is much more noticeable during the summer than during the winter months, perhaps simply because there are more bees in the hives at that time of year. According

to most observers, the end of May and June are the months in which the disease is most rapidly fatal. At this time the stocks are frequently destroyed in from two to four weeks, and in one case at least a stock was completely destroyed in nine days. In the winter* and spring months the bees die less rapidly, two to three months often elapsing between the first appearance of the disease and the destruction of the stock. Infected stocks are not invariably destroyed. Occasionally the mortality in a hive suddenly ceases.† In some cases a hive may nearly die out and then rapidly recover and fill up with brood, but the hive may become badly diseased later. An interesting example of apparent complete recovery described by a correspondent is worthy of note. "All the hives were affected more or less, and bees could be seen crawling about in all directions up to twenty yards from the hives. I think the disease was at its worst between the end of June and July 24th. At this date, I noticed there was a great improvement in the state of the bees, and they rapidly mended until there was hardly a diseased bee to be seen crawling near the hives, and since that time I have seen nothing worth troubling about" (three months later).

In one instance, after apparent complete recovery and the sending off of a strong swarm, the original stock was again attacked and destroyed by the disease. In some cases it has been noted that swarms from a healthy stock acquire the disease rapidly, though the parent stock remains healthy.

Hybrid stock appear to be more resistant to the disease than pure home-bred stock. Most bee-keepers who have kept both kinds are agreed that the Italian hybrids are the last to succumb, sometimes surviving for several months after the others have been destroyed.

Suggested Causes of the Disease.—Among bee-keepers several hypotheses have been put forward to account for the disease.

(a) Several bee-keepers at the western end of the Island

* In exceptional instances the disease has rapidly exterminated stocks in winter, and has progressed slowly in summer.

† Some observers believe that permanent recovery seldom, if ever, takes place. Some improvement may take place after a spring attack, but when breeding ceases in winter the stock dies off, proving that the life of the stock was only prolonged by the constant addition of young bees.

have thought that the unusual prevalence of sea-fogs during the last few years might account for the disease. In other parts of the Island there has not, however, been any unusual prevalence of fogs.

(b) Many have urged that the disease might be due to poisoning from artificial manures or materials used for spraying, especially copper sulphate and Paris green. Careful inquiry has shown, however, that no fresh compounds have been made use of for several years, and that those in use have not been employed in larger quantities than formerly. In fact, very little spraying is done. Moreover, chemical examination of the bodies of large numbers of diseased bees has failed to show the presence of either arsenic or copper. Further, in my own experience, bees from healthy brood introduced into an infected hive have developed the disease.

(c) Some have thought that the disease was due to starvation through the bees being unable to get proper food owing to the fact that clover is less grown than formerly. This hypothesis was disproved by the examination of a large number of hives in which the stock had died from the disease, all of which contained ample stores of pollen and honey.

(d) Some bee-keepers have suggested that certain plants or shrubs may have developed properties poisonous to the bees. Lucerne was especially blamed, but very little is now grown, and certainly not more than a few years ago. Moreover, in some countries it is largely cultivated, and much honey is obtained from it, but no such disease exists in these countries. Furthermore, I have been unable to detect any difference in the pollen grains derived from the alimentary canals of diseased and healthy bees. In my own experiments Italian bees developed from healthy brood, kept in confinement and artificially fed without pollen, developed the disease.

In this connection an experiment by Mr. H. M. Cooper is of interest. He writes : "Five weeks ago I placed two driven lots of bees on six combs, which I had procured from Herts, containing a pollen, and commenced feeding on plain syrup. In a few days they showed symptoms of the disease, so I mixed an acid with the food. It did no good, and now they are all dead. In that time they could not have gathered much, if any, pollen, as the weather was bad."

Experimental Evidence Relating to the Transmission of the Disease.—A number of direct experiments and observations seem to show that after a short period the hives and combs are not infective.

For example, Mr. J. W. Cooper writes: "I have known combs from diseased hives placed in apparently healthy hives without making any difference to the bees" (two experiments). The same authority describes another experiment in the following words: "A month ago a nucleus of these bees was introduced from a strong apiary in Sussex and placed in a hive in which other bees had died three months before. This hive simply had the dead bees and refuse scraped out, but was not washed or disinfected in any way, the idea being to see if bees placed in a hive where other bees had died would get the disease. As far as I can see the bees are healthy up to the present." Nine months afterwards the stock was still healthy. Mr. H. M. Cooper relates the following experiences. "The other lot was placed in a hive where others had died, and was fed with a syrup taken from another lot that had died some months before. Combs were given them from a third diseased lot. These bees began to show signs of the disease after nine months." Infection therefore probably occurred at a later time from some other source. "I have known of four cases of swarms entering hives where other bees had died and keep free from the disease for a long time, say about twelve months."

The results, however, are quite different when swarms enter infected hives which still contain a few diseased bees.

Evidence Relating to the Infective Nature of the Disease.

(1) The disease has gradually spread from one part of the Island to others, and seems to have been recently introduced on to the mainland.

(2) Four stocks of bees at Gurnard, separated by at least two miles from other stocks, remained healthy till May, 1908, although the disease had killed off the majority of bees in other parts of the Island. Since that time one of the four stocks has contracted the disease.

(3) In every case in which trustworthy information could be obtained, it was stated that the foragers were invariably

the first to be attacked, and later the young bees which had not been out of the hive.

(4) It has frequently been noticed that bees which have robbed infected hives have suffered from the disease and have conveyed it to hives up till that time not infected. On this subject Mr. H. M. Cooper writes : "On the other hand, I have seen scores of cases where robbers have caught it almost directly and have been dying off rapidly in about a fortnight, and in two or three cases swarms have entered diseased hives and have all been dead in from twelve to eighteen days."

(5) No satisfactory evidence has been brought forward in support of any of the other hypotheses which have been advanced to account for the disease, while more or less weighty evidence can be urged against them.

The opinion that the disease is infectious has gained ground in the Island, for Mr. H. M. Cooper recently wrote : "I cannot at present say in what way the disease is spread, but I think most people favour the theory of direct contact--often caused by robbing."

Anatomical Investigations.

In commencing my observations on the Isle of Wight disease, I first endeavoured to ascertain whether, by careful dissections, any characteristic lesions could be discovered in the internal anatomy of the diseased bees sent to me from various affected localities. Mr. A. D. Imms, the only investigator who has up to the present published any account of the anatomical observations on bees affected with this disease, writes as follows :—

"The disease is eminently one of the digestive system, and might be described as being a condition of enlargement of the hind intestine. . . . The colon and the adjacent parts of the rectum are enormously distended with a congested mass of material, consisting primarily of pollen grains. . . . The distended colon exerts pressure on the large abdominal air-sacs of the tracheal system, and so interferes greatly with their function. The insect is therefore unable to expand them with sufficient air, which is necessary for flight, and this feature, coupled with the additional weight in the digestive canal, renders the insect incapable, when badly diseased, of flying about." He shows that the inability to fly is not due to paralysis of the wing muscles, but states that in the last stage of the disease the bees do not seem to have strength to move their wings at all. He further states that "while the hind intestine is thus gorged with pollen, etc., the stomach and the remaining portion of the digestive canal contain very little solid matter of any description. Some amount of a dark coloured fluid is present very often in the chyle stomach, but it is not distended with it. The contents of the rectum and colon consist of pollen grains

for the most part, together with a variable quantity of a bright yellow substance in amorphous masses (wax) and a large number of bacteria. There is no individual type of pollen grain common to all bees examined."

I made a large number of dissections, and found that this account accurately described the conditions found in a large proportion of the diseased bees. In such cases Imms further stated that there was an obstruction of the digestive system situated in the rectum itself, and that the muscles of the rectum were tightly contracted, and no pollen was able to pass through. Such a condition I have never found. Further, amongst the apparently diseased specimens, I have not infrequently met with bees in which the colon was empty or only partially distended.

In order to ascertain whether the distended condition of the colon was peculiar to the disease, I procured a stock of healthy bees for examination at various times and under various conditions, and also made observations on healthy specimens which were sent to me from time to time. As a result of these observations, I found that the condition of the healthy bee's intestine varies greatly. In fact, all the variations in the condition of the alimentary canal met with in the diseased bees can be seen in healthy bees under various conditions.

Imms contrasts, by means of a diagram, the digestive canal of a healthy and of a diseased bee. The digestive canal of a bee which has been out of the hive and voided its excrement is well represented by Imms' diagram. If the bees be taken from the hive after a few days' bad weather, when they have had no opportunity of leaving the hive, it is found that the colon is distended to quite the same extent as in many diseased bees. On such bees I have conducted a number of careful experiments, with the following results :—

The weight of the abdomen in the healthy bee varies between 0·030 grm. and 0·073 grm., and that of the colon between 0·012 and 0·054 grm. The weight of the abdomen in diseased bees varies between 0·03 and 0·06 grm., and that of the colon between 0·009 and 0·036 grm.

The contents of the colon, when voided by the healthy bee and deposited on a dry surface, form a dry, brownish mass, similar to that described as occurring on the alighting boards, etc., during the early months of the year in this disease. Bees from the same healthy stock, caught as they returned on a fine day, showed an almost empty colon. Imms seems to have entirely overlooked this natural condition.

It has been shown (Cheshire, 1896, Vol. II., p. 148) that bees normally discharge the contents of their bowels when on the wing, with the air-sacs fully distended. Cheshire, in fact, goes so far as to say that they are "structurally compelled" to do so. Nevertheless, Cheshire (Vol. II., p. 524) himself later shows that bees may defaecate without actually flying, for he mentions "that, under certain conditions (e.g., inadequate protection accompanied by continued low temperature), the bees being forced to the before-mentioned vigorous agitation of the abdomen and a gentle flapping of the wings, the bowel becomes loaded beyond endurance, and the bees, too heavy or too chilled to fly, discharge themselves upon the combs, producing a condition which has been incorrectly described as dysenteric."

In the winter and spring the soiling of the hives, which, as I have mentioned, occurs in this disease, may be brought about in the way

described by Cheshire, since it seems probable that the depleted and diseased occupants of the hive are unable to keep the temperature up to the normal. So far as I have been able to ascertain, no observations on the temperature conditions in diseased hives have been made.

These observations show that the distention of the colon cannot be regarded as a condition peculiar to the disease, and I think that, in the later stages of the disease, it is far more probable that weakness or disinclination to fly gives rise to overloading of the bowel, than that distention of the colon produces inability to fly. Consequently, I regard the condition of the colon as a secondary effect of the disease.

The only constant difference observed was that the chyle stomach of the affected bees was apparently more easily ruptured. This difference was, however, not very marked, and could not be relied upon in diagnosing the disease.

The results of my gross anatomical investigations, instead of aiding me, greatly increased the difficulty of investigating the disease, since they showed that it was impossible to determine whether any given bee was suffering from the disease, either by clinical signs or by coarse dissection.

Microscopical Examination of the Organs.

Having failed to discover by dissection any definite and characteristic changes by which the disease could be diagnosed, the separate organs were carefully examined by means of unstained and stained microscopic preparations and sections.

No changes were discovered in the salivary glands, brain, fat-body, heart, tracheæ, air-sacs, Malpighian bodies, or honey stomach. Sections and microscopical preparations of the wall of the colon showed no changes. This portion of the gut contained pollen grains of various kinds, masses of wax and bacteria. No differences were noticed between the varieties of pollen grains found in the gut contents of normal and diseased bees. Many of these pollen grains do not appear to have undergone digestion.

The chyle stomach in many cases showed marked changes in section. In the normal bee the cells of the lining membrane are extremely well defined. In some diseased bees, presumably those in the early stages of infection, many of the cells of the lining membrane appeared swollen and ill-defined, and detached cells were seen in the lumen of the gut. In more advanced cases many cells have become detached, and of those which remained in position, the majority stained badly, were vacuolated, irregular in shape, and possessed irregularly staining nuclei. These changes were more marked in certain places than in others. In the most advanced cases the cells had in some places become completely detached from the basement membrane, while everywhere the cells appeared greatly degenerated. The lumen was filled with desquamated cells and granular material.

No protozoa or worms were seen in any of the preparations.

Bacteriological Examination.

Smear preparations and cultures on various media showed the blood, fat-bodies, tracheæ, salivary glands, Malpighian tubes, etc., to be free from bacteria. The disease is, therefore, not accompanied by a general bacterial infection.

A bacteriological examination of the gut contents was next under-

taken. Smear preparations, made from the contents of the colon of both diseased and healthy bees, showed very large numbers of bacteria. These belonged to several species, but, on morphological grounds alone, none could with certainty be identified as occurring only in diseased specimens. An attempt was therefore made to differentiate the organisms by cultures on several media, and by these means a number of different species were isolated. All the species isolated from diseased bees were, however, discovered in healthy specimens. These investigations were rendered unsatisfactory owing to the number of film-forming organisms, which were almost invariably present, and which rapidly overgrew the cultures.

In consideration of the fact that certain differences, both anatomical and histological, were found between the chyle stomachs of healthy and diseased bees, my attention was finally concentrated on the contents of these organs.

It was soon discovered that certain plague-like bacilli were frequently observed in smears made from the internal lining and contents of the diseased chyle stomach, but were never seen in similar smears from healthy specimens.* Out of 108 smears from diseased bees, 67 (62 per cent.) contained these organisms and 34 did not, while in 7 a few doubtful bacilli were noticed. My attempts to cultivate these organisms were not very successful. Primary cultures were always difficult to obtain, but when the organism had become accustomed to artificial media, after two or three generations it grew well. Very frequently no plague-like bacilli grew in the cultures even when the smears had shown them in large numbers.

In the attempts to get constant results in the primary cultures, a number of different media were tried: agar, glucose agar, saccharose agar, honey agar, and agars containing various sugars, together with bee larva extract (bee agar)†, gelatin, potato, broth, glucose broth, serum broth, honey broth, bee-honey broth, bee peptone water, and others. Cultures were often made in series, one series being cultivated at room temperature, one at 25° C. and one at 37° C. No differences were observed except in the rate of growth, which was more rapid at the higher temperatures. In none of these media did the plague-like bacilli grow readily in primary cultures, either aerobically or anaerobically.

Altogether cultures on various media were made from 60 diseased bees, and in those made from 21 (35 per cent.), plague-like bacilli grew in greater or smaller numbers. From only a small proportion of these, however, was it possible to obtain pure cultures. As controls, cultures were made from 42 healthy bees, but plague-like bacilli were never cultivated. Many cultures from the chyle stomachs of both healthy and diseased bees, even when sown with abundant material, showed no growth.‡

A number of sections of both diseased and healthy chyle stomachs,

* In only two preparations from healthy bees were a few doubtful organisms seen.

† *Bacillus larvæ*, probably the cause of American Foul Brood, will only grow on media to which bee larva extract has been added. (White, 1906, p. 43.)

‡ When a mass of chyle stomach is placed on the surface of a gelatin slant the medium round it is rapidly liquefied, but frequently no bacterial growth

stained so as to demonstrate bacteria, were examined. Bacteria were far more numerous in the diseased specimens, and the plague-like organisms were frequently observed in them. In the least marked cases they were mainly confined to a layer of poorly staining material, which is constantly found in contact with the internal aspect of the lining membrane. In some places they were found between the cells passing down almost to the basement membrane. In the more advanced cases they were found in large numbers in the granular material filling the lumen of the gut, and between the cells of the desquamated epithelium. Great numbers were found near to the basement membrane in those regions in which the cells had become detached. Frequently they seemed to be within the degenerated cells.

Characters of the Plague-like Bacillus.—In film preparations made from small portions of the chyle stomachs of diseased bees teased out on glass slides and stained with methylene blue, the bacillus appears as a short, round ended, thick organism with darkly staining ends and lightly staining central bands (polar staining), and closely resembles *B. pestis* in general appearance. Hence I propose for it the name of *Bacillus pestiformis apis*. These bacilli usually take up the stain rather more deeply than most of the other organisms met with in these smears, a fact which materially diminishes the labour of looking for them.

In pure cultures the bacillus has the following characters:—

It is an aerobic, non-motile, Gram negative, non-acid-fast, short, broad bacillus, varying in its morphological appearances upon different media: No flagella could be demonstrated. On agar it grows fairly well, forming in twenty-four hours medium-sized (largest 0·1 cm. in diameter), round, white or slightly yellowish, smooth, glistening, flattened, dome-shaped colonies. On further growth the colonies do not increase much in size, and unless very thickly sown they show little tendency to coalesce. After twenty-four hours' growth the bacilli are of medium length (1-1·5 μ), broad, and with distinctly rounded ends. Many of them are distinctly oval. They have a tendency to stain better at the ends than in the middle (polar staining). Occasionally the lightly staining central portion appears as a distinct band, especially when the organism is lightly stained. After seven days' growth very little general change is noticed, though a few large involution forms make their appearance. On gelatin growth takes place rapidly in the form of colonies, resembling those produced on agar. The organisms are more rounded than on agar, being distinctly oval in shape, and polar staining is not so marked. On potato a considerable raised cream-coloured growth is produced in twenty-four hours at 37° C., which continues to spread. The bacilli are larger than when grown on agar, but the light central band is not quite so well defined. When stained by Neisser's method, a few show polar bodies (metachromatic granules). Involution forms, many of which grow to a large size, appear rapidly, and are very abundant after forty-eight hours' growth. In broth at 37° C. a cloudy growth is first formed, but later the medium becomes clearer, and a considerable yellowish, flocculent deposit is produced. A surface film is usually seen after a few days' growth, and may be very marked. If the tube is shaken, the film sinks, or is broken up, but another forms. The bacilli resemble those found on gelatin cultures. No acid or gas is produced in media containing glucose, lactose, saccharose, dulcite, mannite, maltose, dextrin, or glycerine.

Pathogenic Properties.—A single infection experiment was made with a culture of this bacillus. A healthy stock of bees was placed in a hive in a green-house. After a few days all the openings were closed with muslin, and the bees fed on syrup. When the bees had become accustomed to this treatment, broth cultures of the bacillus were mixed with the syrup. Within a few days considerable numbers had died, and specimens of apparently diseased bees showed the bacilli in their chyle stomachs, which also showed the fragile condition found in naturally infected bees. Distention of the colon could not be taken as a diagnostic point, as this condition was found to be present in healthy specimens of this stock taken from the hive before the experiment was started. The majority of the bees showed no signs of disease a week after feeding was commenced.

Summary.

Infectious Character of the Disease.—The history of the spread of the disease throughout the Isle of Wight, the characters of the individual outbreaks in various localities, the results of experiments with healthy stocks and infected hives and observations on natural infection in isolated hives, together with the absence of any sufficient reason for suspecting intoxication from food materials, all point strongly to the infective nature of the disease.

In the investigation of the disease many difficulties presented themselves. Bees sent for investigation in small numbers, especially those in an advanced stage of the disease, travel badly, and a large proportion of them are dead on arrival. After death putrefactive changes set in rapidly, especially in warm weather, rendering bees dead of the disease useless for examination. Even those which arrive alive seldom live more than a few hours. In such cases the examination of specimens had to be undertaken without delay, often at very inconvenient times. In addition to these difficulties it was often impossible to obtain any specimens for considerable periods owing to apparent temporary cessations of the epidemic. At a later period a stock of diseased bees was obtained through the kindness of Mr. H. M. Cooper, and kept under observation at Cambridge.

Presuming the disease to be infectious, it was necessary to keep these bees in confinement under artificial conditions, the hive being placed within a muslin cage and the bees fed on syrup. How far these conditions influenced the course of the disease in this stock it is impossible to say.

The impossibility of determining, either by clinical observation or by dissection, whether any individual is suffering from the disease renders investigation peculiarly difficult. From the clinical point of view the most characteristic features are: a more or less sudden and rapid mortality amongst the bees, disinclination to work, some distention of the abdomen, frequently dislocation of the wings, and later inability to fly. These symptoms are unaccompanied by any disease of the brood or combs. The disease therefore can only be recognised by observing the general condition of the stock, since the individual bees, apart from their connection with the diseased stock, do not exhibit any constant and characteristic symptoms which are not occasionally to be met with in other conditions.

Anatomically the majority of diseased bees show great distention of the colon, and a fragile condition of the chyle stomach. In many obtained from diseased stocks, and apparently suffering from the disease, distention of the colon is absent. All the organs, except those just mentioned, are normal. Healthy bees confined to their hives for a few days very closely resemble diseased bees in regard to the condition of their intestinal canals. It is impossible, therefore, both from the clinical and anatomical points of view, to diagnose whether any given bee is suffering from the disease or not.

Histologically the chyle stomach appears to be the only organ affected, and bacteriologically plague-like bacilli were frequently encountered in it, in some cases apparently within the epithelial cells. These bacilli were not found either in the brood of diseased hives or in the chyle stomachs of healthy bees. For these reasons I am inclined to regard these organisms as the cause of the disease. I am, however, well aware that I have not fully established their relationship to the disease, since I have not been able to demonstrate them in every case either microscopically or by culture, or to find, except in very advanced cases, any very definite lesions constantly associated with their presence. I feel that my inability to discover any means of cultivating the organism with certainty even from chyle stomachs, in which it was present in abundance as shown by microscopical preparations, constitutes the most serious difficulty in establishing .

its relationship to the disease. By their morphology alone, few pathogenic bacteria can be recognised, since morphologically indistinguishable, but non-pathogenic, organisms are frequently encountered. Consequently, until some satisfactory cultivation methods have been discovered, the bacteriological diagnosis of this organism must in most cases remain in doubt, for organisms simulating it in morphology probably exist.

The Pathological Course of the Disease and Mode of Infection.—If my observations are correct, the disease must be regarded as an infectious one which primarily affects the chyle stomach. Here the specific organism multiplies and brings about a destruction of the lining epithelium. Judging from the condition of many of the pollen grains found in the colon, this apparently results in the food passing undigested through the chyle stomach. Either for this reason or because the constitutional effects of the disease prevent the bees from flying and voiding their excrement, the colon becomes greatly distended in the last stage of the disease. The actual cause of death is uncertain, but it is probably brought about by malnutrition, possibly combined with the absorption of a specific poison and of the products of decomposition in the colon, and probably aided to some extent by imperfect oxygenation of the tissues, owing to the pressure exerted by the distended colon on the abdominal air-sacs.

In regard to the mode of infection and dissemination very few definite statements can be made. There is some evidence to show that foragers, and more particularly robbers of infected hives are the first to be attacked, and communicate the disease to other members of the hive. The organism probably enters by the mouth, and infection may be spread by means of the contents of the honey stomach, or in the later stages by the infected excrement. Whatever the precise means may be by which infection is carried, the adult bees are alone affected, and there is satisfactory evidence to show that after a short period of time neither the combs nor the honey are infective.

Treatment and Prevention.—From the nature of the disease it seemed scarcely likely that its progress would be arrested

by drugs, and, as a matter of fact, most of the recognised medicinal methods of treatment have already been employed by practical bee-keepers without permanent success. Since remedial measures cannot be relied on, and the affected area (the Isle of Wight) is at present small, an attempt to extirpate the disease completely seems justifiable. This would necessitate the destruction of all the diseased stocks in the Island. As the number of these at the present time seems to be very limited, and since the disease almost invariably ends in the complete destruction of the hive, such a measure would not entail very serious loss. With every precaution a few diseased stocks would be overlooked, and give rise to later outbreaks. Such stocks would also have to be destroyed as soon as the disease was diagnosed.

Relationship to Other Diseases.

Bee Paralysis.--This disease is uncommon in this country, but is more common in warmer climates. In the early stages the affected bees are seen leaving the hives with the abdomens greatly swollen. The latter are dull black. Later, some are seen trembling or shaking with wings bent up in an unnatural position. The Isle of Wight disease appears to differ from bee paralysis in that the affected individuals do not exhibit the black and shiny appearance or the trembling motion of the limbs and body which is regarded as a typical symptom of that disease. Some bee-keepers of experience, however, seem inclined to regard the disease as a severe form of bee paralysis.

Bee paralysis often readily yields to treatment, but this disease is not influenced by any form of treatment which has hitherto been tried.

It is believed by some bee-keepers that *B. Gaytoni* of Cheshire is the cause of paralysis, but this is not claimed by Cheshire, and the belief is not grounded on bacteriological findings. (White, 1906, p. 44, and 1907, p. 16.)

The May Pest.--This disease occurs on the Continent, and usually appears in May or June, when an early spell of warm weather is followed by cold or foggy days. The disease attacks indiscriminately bees young and old, and the abdomen of those affected appears slightly inflated, the whole body

being covered by a light grey dust. The stomach, when examined, is found to contain a small quantity of light straw-coloured fluid, and at the end of the large intestine there will be seen a yellow knot of partially digested pollen. (Cowan, VII., 1907, p. 187.) Inability to fly seems to be the chief symptom of the disease. The disease is said to be due to the growth of a fungus, *Mucor mellitophorus*, among the fat corpuscles of the abdomen. In some cases the mycelium grows so thickly as to prevent the circulation of air for the distention of the air-sacs, and occasionally the chyle stomach is completely stopped up by spores. In the Isle of Wight disease no fungoid growth of this nature has been noticed.

Dysentery.—This usually appears in the winter and early spring, when the bees are unable to leave their hives for some days. Bees affected with dysentery discharge their excrement over the combs and hives. The fæces are dark and muddy in appearance, and often have a peculiar offensive smell. The bees are weak and slow in movement, and decrease unusually fast. This disease, which attacks bees during the late winter and early spring, is generally ascribed to insufficient or unwholesome food. The cure for this disease is very effectual. It is simply to remove the cause and supply a healthy regimen. According to Cheshire (Vol. II., p. 572), torulæ or allied organisms are frequently found in the fluids of dysenteric bees.

Though the bees suffering from the Isle of Wight disease often exhibit symptoms resembling those of dysentery in the early months of the year, the two diseases probably have no connection with one another, since the one is not influenced by treatment, while the other yields to it readily. Moreover, I have been unable to demonstrate the organisms found by Cheshire in the contents of the alimentary canal, and bee-keepers have not noticed any offensive smell or fermentation in the honey which often accompanies dysentery.

Appendix.

Observations on Diseased Bees Kept in Confinement.—A strong stock of bees, which had shown signs of the disease for several weeks, was sent by Mr. H. M. Cooper, of Thorley, Isle of Wight, and arrived on June 27th, 1908. A few had

died on the journey, but on being placed in a hive the bees were sufficiently numerous to cover eight frames, which contained an abundance of pollen and honey, but no brood. This hive was kept in a warm room in an enclosure made of muslin.

By July 8th several hundreds had died. On that date a frame of sealed Italian brood, containing about 2,700 larvæ, was placed in the hive. These began to emerge in a few days, and by July 16th had nearly all hatched out. A few had by this time begun to fly about, but the majority still remained on the combs. By July 26th some of the Italian bees appeared to be suffering from the disease, and a few had already died. By August 10th the survivors of the old stock had ceased to fly, and remained on the combs. The Italians were now dying rapidly. On September 1st four frames, which contained a fair amount of honey, were removed as the bees were unable to cover them. In one of the four remaining frames there were a few sealed brood cells, from which the young bees hatched out during the next few days. By September 29th the bees were only able to cover two frames, and only about 50 Italians remained alive. The stock had completely died off by October 26th. The queen was seen on several occasions, and remained apparently healthy up to the end.

I am not acquainted with any experiments involving the keeping of healthy stocks under these conditions, and consequently have no means of gauging how far the artificial conditions affected the course of the disease.

The majority of my anatomical and cultural observations were made on bees derived from this stock.

If the opportunity occurs, I hope to continue these investigations this year. I take this opportunity of recording my thanks to Dr. G. S. Graham Smith, of this Laboratory, for assistance and suggestions. My thanks are also due to the Isle of Wight bee-keepers, who afforded me every opportunity of investigating the disease on the spot, and who also sent diseased bees for examination, particularly Mr. H. M. Cooper, of Thorley, and Mr. J. W. Cooper, of Shanklin.

THE CULTIVATION OF WATERCRESS.

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For the past five or six years the cultivation of Watercress (*Nasturtium officinale*) cannot be regarded as having been very remunerative; nevertheless it continues to be grown extensively in many districts in the South of England; and, being in demand as a salad at all times, provides employment for both men and women throughout the year, excepting two or three months in summer when the plants are flowering and producing seed.

The industry suffered somewhat considerably some years ago by plants being grown in water contaminated by sewage, and in pools more or less in a state of stagnation; of late years, however, such beds as these have almost disappeared, and it can safely be said that watercress is now cultivated under most perfect hygienic conditions. At that period, when the public mind was prejudiced against watercress, on account of the impurities that it might contain, the common garden cress (*Lepidium sativum*) found more favour as a salad, as also did the American or Land Cress (*Barbarea præcox*), the latter being extensively grown; and on account of its resemblance to watercress in flavour it did much towards lessening the demand for aquatic varieties of cress. The fact that it can be sown for succession from March till September is also another point in its favour.

Watercress is a hardy perennial, which is found growing wild in streams and ditches, and is a native of Britain. Under cultivation it cannot be equalled as a salad, and, apart from its appetising and refreshing flavour, it possesses important medicinal and health-giving properties, which deserve to be better known and appreciated among all classes of society. The plant contains sulphur in various forms, and is rich in mineral matter. Like mustard, it contains an aromatic oil to which it owes its pungent taste, and to some extent its medicinal value.

Varieties.—There are several varieties of watercress, but the two most common are Brown-leaved or Winter Cress, and the Green-leaved or Summer cress; the former variety is most in demand, and its cultivation is principally restricted

to running waters; it must, however, not be confused with the wild type, which has much larger leaves, and is inferior in quality, and less prolific. The Green variety is usually associated with still waters, wherein the use of manures stimulates its growth and increases its yield for cutting. Cases of typhoid have, however, been traced to this particular variety when grown in polluted water, a danger which never occurs with the Brown-leaved variety.

Source of Water Supply.—The majority of districts in which watercress is now grown are favoured with a supply of



WATERCRESS BED BEFORE CUTTING.

pure fresh water from springs, usually having their origin in the chalk formation. The temperature of these springs does not generally vary much from 50° F., and extremes of heat and cold are thus guarded against. Some waters, having a higher temperature, and probably containing different mineral ingredients from others, are favourable to the production of early crops. The further the beds are from the source of the spring, the less productive they become, as the plants suffer from the variation of temperature, which gives the older foliage a yellow and sickly appearance. On the other hand, water having too high a temperature encourages the production of puny and discoloured plants.

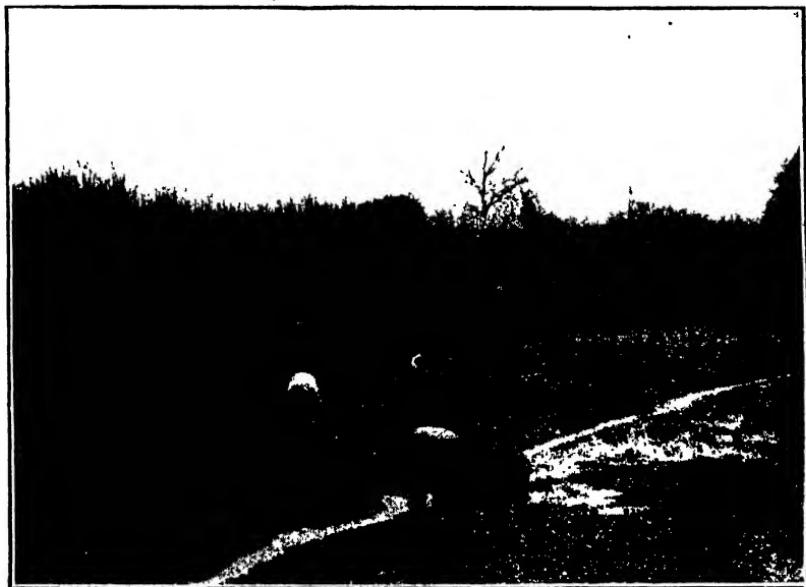
Locality.—In selecting a locality for the formation of beds, it is necessary to consider carefully the distance from a railway station and the facilities offered for quick transit at moderate rates. If the area under cultivation is small and situated several miles from a station or convenient market, the cost of carriage may be prohibitive.

Soil.—Much of the success of watercress growing depends on the soil. Beds having a bottom composed of gravelly loam are to be preferred to any others, as a firm bottom enables the workers to move more freely through the water, and the roots are also kept well nourished. Chalk is another suitable bottom when covered lightly with loam, so as to afford a medium wherein the plants may root. Loose sandy loam, pure clay, and peaty soils are to be avoided, as they cause much additional expenditure in keeping in order. Sand and peat bottoms usually require making up with chalk, as a means of preventing the downward filtration of the water. Excellent beds are, however, to be found overlying peat, but they are less remunerative to the owners than those with a gravel bottom.

Formation of Beds.—No definite rules can be laid down with reference to the depth, length, breadth, and general form of the beds; the depth will depend on the level of the springs, which in many instances are close to the surface. Beds are better slightly sloped, so that the water may force its way more freely through the foliage, yet without in any way disturbing the soil beneath. Where the stream assumes a considerable breadth, it is found necessary to construct gangways composed of fibrous turf, chalk, boards, or some other suitable material. In many cases it is necessary to dam sections of the stream in order to hold back the water, thereby affording facilities for cleaning out and repairing the beds, and, if need be, for submerging the plants during periods of hard frost, which would otherwise do considerable damage to the young foliage, and arrest the growth of the plants.

Propagation.--The general method of propagation is by division of the plants, and is usually commenced between hay-making and harvest, and continued until the end of October. The top of the plant is pinched, or cut out, the length of the cutting or divided portion generally averaging

one foot, but varying according to the depth of the water. Many growers use some of the smaller streams, and particularly those which are somewhat isolated from the principal beds, for the purpose of growing stocks for planting; they maintain that by adopting this practice they are able to obtain plants of a more robust constitution and cleaner than those from old beds. The green or summer variety of cress is usually self-seeded; or seed that has been saved is simply broadcasted in the mud.



CUTTING WATERCRESS.

Replanting.—The beds should be thoroughly cleaned out and replanted each season. This operation is a considerable item in the cost of cultivation, as all the spent soil, mud, &c., together with the roots, should be removed, and the bed thoroughly flushed with fresh water before replanting is commenced. Like other cultivated plants, cress requires good wholesome soil, which should be well aerated and exposed to the sun in preparation.

Some growers prefer to plant the bed by laying the young plants in rows across the bed, pressing the cut ends into the soil or fixing them in position by means of stones. When the whole work is completed the water is admitted very gradually so as not to displace any of the plants. The more

common practice, however, is to drop the plants into the water at regular distances after the beds have been recharged with water.

Gathering and Bunching.—As with all perishable goods, the question of marketing is an all-important one, and demands strict attention to detail. One acre of beds will usually keep three men employed throughout the cutting season, the number being reduced to one man for the winter months. A good man, well up to his work, will cut as many as 100 dozen bunches per day; for this and other operations performed in the water the men are provided with watertight boots, which must be of good quality and may cost from £2 10s. to £3 per pair. Should the bottom of the beds be boggy, it will be found necessary for the men to stand on boards placed under the water and over the cress which has already been cut.

The bunching and tying is generally done by women, who receive on an average $\frac{1}{4}$ d. per dozen bunches, a good hand being able to earn from 15s. to 18s. per week.

In gathering, it is important to select the stems or shoots that are most forward in growth; thus it is not always advisable to pay gatherers by piece work; growers usually know their men, and a reliable man may receive 25s. per week during the season, and 18s. to £1 during the winter. By selecting only the stronger growths and leaving the weaker ones, the beds will be ready for cutting again in a much shorter time. Growers with a reputation at stake always make a point of washing their cress before bunching.

Conveyance to Market.—Much of the cress which is consigned to towns in the North of England is sent by passenger train; whereas the general consignments for the London markets are conveyed by goods train. The packages used are either flats, which hold on an average 18 dozen bunches; or two-bushel hampers, capable of holding from 30 to 36 dozen bunches in cold weather, and about 24 dozen when the weather is warm. The hollow packing in warm weather admits air, thereby preventing heating, which readily destroys the colour and freshness of the foliage; not infrequently a small block of ice is placed in the centre of the basket, and this has a good effect. Of recent years large quantities have been sent to

market loose in packages of two to four stones each, being usually conveyed direct to the northern markets by the midnight mail trains. These consignments are usually sold on commission. The gross prices varies from 1s. 6d. to 2s. 6d. per stone.

In the majority of cases the salesmen supply the baskets and pay carriage, but many of the oldest growers still use their own baskets, which are branded with their name or trade mark, this being a guarantee of quality. These consignments are delivered carriage paid, while the agents deduct their commission, and pay carriage on returned empties.



GATHERING WATERCRESS.

Prices Obtained.—Early supplies from February to March will give an average return of 6d. per dozen bunches; from then on to the first week in June the average may be taken at 4d. A very fair average for the season may be taken at from 25s. to 30s. per 100 dozen bunches, after deducting carriage, salesmen's commission, and sundry incidental expenses.

Rental and Cost of Beds.—The question of rental and cost of maintaining watercress beds must be viewed from a broad standpoint, and the rents of late years will not compare with those paid previous to 1897, when watercress growing was

undoubtedly a prosperous industry. Some of the early beds are now rented at £30 per acre, while others can be had for £15 and less.

The original cost of formation of many of these beds was considerable, as much as £100 per acre being expended upon them, according to the amount of earth to be excavated. If plants are to be purchased, these may cost as much as £10 per ton, and usually two tons are required to plant one acre.

Where springs are numerous, the surrounding ground can soon be made adaptable to them at a small cost, and at the present time it is questionable if it would ever pay to lay out money in the preparation of new beds on the lines mentioned above.

Pests.—In common with all other cultivated plants, watercress is subject to numerous enemies in the form of animal and plant life, of which the following are most frequently met with. The fresh-water shrimp (*Gammarus fluviatilis*) attacks the young shoots, thereby doing a considerable amount of harm; it can, however, be kept in check by the use of quicklime, which is applied to the incoming water, and therefore in no way harms the plants. The water beetle (*Dytiscus marginalis*) is a common and voracious occupant of most cress beds, but it is very doubtful if it does any real harm. The Caddis worms (*Limnephilus flavicornis*) find a home in many beds, and are never in water that is contaminated. When a bed becomes badly infested, it is found best to clear it of plants in the autumn, and drain out the water for several weeks; when the bed is again flooded the worms will float to the surface, and can then be drained into the storm or surplus water. Fresh-water snails in their various stages of development are also a source of trouble and annoyance to the grower.

The turnip fly (*Phylloptera nemorum*) does not confine its ravages to seedling turnips, but, in addition, does considerable damage to cress beds, more especially when the crops are badly nourished, and when the banks are infested with weeds of the cabbage tribe, whereon the flies find shelter and food, until such time as the cress affords an opportunity for attack.

Weeds.--The abundance and variety of weeds to be found

in watercress beds are to some extent regulated by the industry and cleanliness of the cultivator. The most troublesome



WASHING WATERCRESS BEFORE PACKING.



"BUNCHING" WATERCRESS.

of all are the several species of *Lemna*, particularly *Lemna minor*, the lesser Duckweed, which can only be kept in check

by submerging the cress and floating them off the surface. Other plants which cause trouble are Pondweeds, Frogbit, Procumbent Apium, Water Starwort, Brooklime, and Water Thyme.

The cultivator of the green-leaved cress has usually a larger variety of weeds to contend with than the growers of the brown-leaved variety, as in the former case many semi-aquatic weeds are distributed by birds, and soon germinate on the surface soil.

There appear to be no fungoid diseases to which watercress falls a prey, although growers speak of the verdigris disease; this, however, appears from careful observation to be nothing but a discolouration or decay of the foliage due to its contact with the excrement of waterfowl.

A DEMONSTRATION OF INTENSIVE CULTIVATION.

PRINCIPAL M. J. R. DUNSTAN, M.A., F.R.S.E.

South-Eastern Agricultural College, Wye, Kent.

The following record of an experiment in intensive cultivation is not put forward as either original or as due to any special skill in management or marketing, but as a possible suggestion to small holders for the utilisation of their opportunities for growing crops which can be marketed through the ordinary wholesale or retail channels in small or large quantities. The relation of the experience may evoke the criticism that the results are due to an exceptional season and exceptional conditions of sale. Exceptional seasons, however, occur nowadays with some frequency, and the conditions under which the produce in this case was marketed did not differ from those obtained by many alert and businesslike producers.

On the College farm each year are grown some 13 to 20 acres of potatoes, this area being devoted to earlies, mid-season, and late varieties. In 1908 some 6 acres were set with earlies in Wye field, the soil of which is a fairly deep useful loam with the chalk some distance below, rented at 30s. per acre, and lying at an altitude of 160 feet and unsheltered. The previous crop was oats, of which a yield of 9½ qr. was obtained, and the land was in good heart and

clean. The varieties of earlies grown on the area under experiment, about $\frac{1}{2}$ acre, were Epicures and Mayqueens; the sets were sprouted in boxes, and planted on April 7. The cultivation and manuring of the crop were as follows:—The oat stubble was dunged with 25 loads of farmyard manure per acre, shallow ploughed in November just to cover the dung; deep ploughed two months later, ridges drawn and artificials sown, boxed sets planted, ridges split to cover seed; saddle-harrowed down three weeks later; ploughed with chilled plough between ridges, immediately harrowed down; hand-hoed and earthed up. The artificials sown comprised 3 cwt. superphosphate of lime, 1½ cwt. sulphate of potash and 1½ cwt. sulphate of ammonia. The cost of these operations, including rent, manure, seed, digging, and carrying to station is calculated at £16 5s. per acre. The crop, which averaged 9 to 11 tons per acre, was sold f.o.r. at prices from 70s. to 90s. per ton, commencing July 7, in a not over-favourable market. The gross return per acre was £37 1s. 4d., and as some of the crop was charged with some railway expenses the net return was £35 11s. per acre. Directly after digging, the land was ploughed (this ploughing perhaps might have been omitted), and cauliflower plants were put in; the season was very dry, and a day or two might have been gained under more favourable conditions. As it was, the plants were watered in, with the result that there was no flagging, and they got a good start. The plants were put in at the rate of 10,000 per acre at a cost of 4s. per 1,000 for plants. A hundredweight of nitrate of soda was given them, and they were hand-hoed once and horse-hoed twice. Selling began on October 28, when consignments were sent to the Borough Market, Bexhill, and some few were sold locally in Wye and Ashford. In all, 7,770 heads were marketed at an average price of 1·135d. per head, realising per acre £40 11s. 4d. The cost of plants, labour, manure, cutting, packing, delivery, rail charges, commission, and returns of empties (they were packed in nets and potato "pads") amounted to £10 per acre, so that there was a net return of over £30 per acre, which, with the net return of the early potatoes, makes a total of over £49 per acre from the two crops. It will be noticed that the

whole of the manure applied is debited to the crops, but it is intended to take a crop of oats on the ground this year (1909) without further manuring.

It is not argued that such a result can be obtained always, or that by a great increase of the area a proportionate increase in the returns may be expected, but as it has been done under not the most favourable conditions it may be done again. The estimated labour represents one-fourth of a man's time, so that it would appear that such a venture might prove remunerative for small holders under certain conditions. In the event of the cauliflowers failing to head, or the crop not being marketable from any other cause, they will prove suitable sheep feed, so that the value need not be entirely lost. The capital required is that for the first crop only, since the returns from the potatoes are available for the expenses of the cauliflower crop. Other catch cropping demonstrations are in progress, and the results of these, if they prove of sufficient interest, will be made known this year; but to the clever cultivator there are many crops which would lend themselves to such intensive cultivation with good results. The success of this trial is mainly due to the management of Mr. James Morison, the Superintendent of the College farm, who with the writer will be glad to give any further information with regard to details.

GLANDERS AND FARCY.

Definition.—The names Glanders and Farcy relate to one and the same disease, which is caused by a microbe—*Bacillus Malleus*. The term "Farcy," however, is usually applied to those cases in which the disease is located on the surface (skin) of the limbs or body, and the term "Glanders" is used to describe the disease when the principal symptoms are seen in the nostrils, glands under the jaw, and lungs.

Animals Susceptible to the Disease.—Horses, asses, and mules are most commonly affected with Glanders. The dog, the cat, and the wild carnivorous animals may be infected. The ox never contracts the disease under natural conditions, while for all practical purposes the sheep, goat, and pig are immune. It is important to remember that man also may contract Glanders from diseased horses.

Symptoms.

"Occult" Glanders.—A horse may be affected with Glanders and show no particular symptom beyond a general unthriftiness, and is often looked upon by those in the stable simply as "a bad doer." This form of the disease is spoken of as "occult" or "hidden" Glanders, and can only be diagnosed by the aid of the Mallein Test.

Occult Glanders in a stable is a serious matter. Animals so affected may at any time develop some slight discharge from one or both nostrils, which is either continuous or appears at intervals. Such a slight discharge, especially if it only appears at intervals, is frequently not observed, or when seen is often not regarded with any suspicion until the animal "breaks up," and develops more advanced symptoms of the disease or dies from Glanders. During that time, however, the horse may have infected other healthy horses and even man himself.

Not infrequently cases of occult Glanders are discovered at the post-mortem examination of animals which have died from other causes, and were not suspected during life.

Typical Glanders.—In typical clinical cases of Glanders there is a thick, grey-coloured discharge from one or both nostrils. Ulcers and ulcerous patches are to be seen inside the nostrils, and the glands under the jaw are enlarged and hard, forming a lump which is commonly known as a "Jug." The temperature may be raised, but in chronic cases it may be no higher than the normal.

Acute Cases.—In severe and acute cases the temperature is several degrees above normal, and the animal shows distinct symptoms of respiratory disease.

Farcy.—In Farcy one or more limbs become swollen. The lymph vessels stand out prominently on the inside of the limbs. They have a cord-like feel to the hand, and small nodules appear along the course of the vessels. These nodules frequently burst and become ulcers, which discharge a thick, yellow fluid of oily appearance. The ulcers may heal and leave a scar, but they usually break out again.

Farcy may also appear on the skin of the neck and body.

Post-mortem Examination.—On post-mortem examination,

in addition to the symptoms already described, one may find ulceration of the throat and air passages, or, as is more constant, small shot-like nodules are present in the lungs. They are formed by tissue products due to the action of the glanders microbes contained within them. The nodules vary in numbers from one or two to hundreds.

Virulent Material and Method of Spread.—The discharges and sores present in Glanders and Farcy are very virulent or poisonous because they contain the microbes which cause the disease. Glanders is spread to a healthy horse either directly by contact with a diseased horse, or, indirectly, by such things as mangers, buckets, harness, grooming and stable utensils, sponges, contaminated food or water, and, in fact, anything upon which a glandered horse has left some virulent discharge.

The usual method of infection, however, is by ingestion, that is, the virulent material is taken into the animal's body by way of the mouth.

Preventive Measures.—The spread of Glanders to healthy animals can be prevented by the removal and proper destruction of all diseased animals, and a thorough disinfection of all places and articles which are liable to have been contaminated by the virulent discharges.

It is also necessary that the Mallein Test be applied to all animals showing suspicious symptoms, and to those animals which have been in contact with a diseased or suspected animal, and which may therefore be affected with occult Glanders.

The application of the Mallein Test requires some skill and experience, but it is quite a reliable test for the detection of occult Glanders in the hands of a veterinary surgeon.

A warning is desirable (especially to those who are brought into contact with horses) that a human being may contract Glanders from a diseased horse by inoculation through a wound or by rubbing a mucous membrane, such as that of the eye, with the soiled fingers, and that care should therefore be exercised in the handling of horses or the carcases of horses which may be affected with the disease, or suspected of being so affected, in order that this risk may be avoided.

In any case where handling is necessary the hands should



PARASOL MUSHROOM
(Lepiota procera, Scop.)

be immediately afterwards washed with soap and water, to which some suitable disinfectant has been added in the prescribed proportions.

Duties of Owners under the Glanders Order.—Under the Glanders and Farcy Order of 1907, made by the Board of Agriculture and Fisheries, it is the duty of every person having or having had in his possession or under his charge any diseased or suspected horse, ass, or mule, to give immediate notice of the fact to a constable of the police force for the police area wherein the diseased or suspected horse, ass, or mule is or was.

The duty also applies to every person licensed to slaughter horses in respect of a carcase of any diseased or suspected horse, ass, or mule in his possession.

Failure to comply with the requirements of the Glanders and Farcy Order of 1907 renders a person liable to a fine of £20, and, in certain circumstances, to a month's imprisonment with hard labour.

EDIBLE FUNGI.

II.—THE PARASOL MUSHROOM. (*Lepiota procera*). *

The Parasol Mushroom (*Lepiota procera*, Scop.) is one of the most abundant and generally distributed of edible fungi, and fortunately has no double amongst poisonous kinds that might be mistaken for it. When young the cap is globose, gradually expanding during growth until it is quite flat, with more or less of a boss in the centre, and covered with brown scales on a whitish ground, five to nine inches across. Stem six to eight inches high, base thick, becoming slender upwards, whitish with brown markings, furnished with a broad, loose collar or ring; the gills are persistently white.

It grows in open glades in woods on heaps of leaves, &c., and is considered by some as the most dainty of our edible fungi. The flavour is delicate, and best retained by a process of gentle stewing in a closed vessel.

* For Edible Fungi. I.—The Common Morel, see *Journal*, Sept., 1908, p. 431.

Wood Leopard Moth.—A caterpillar forwarded during December from Hassocks (Sussex), where it was damaging

jasmine, was identified as that of the

Notes on Insect,
Fungus, and other
Pests.*

Wood Leopard moth (*Zeuzera aesculi*).

Leopard moth caterpillars are injurious to the stems and branches of many trees, e.g., ash, lilac, oak, walnut, alder, hornbeam, horse chestnut, sycamore, plane, lime, box, holly,

poplar, willow, elm, apple, pear, plum, hawthorn, and guelder rose, but the fact that this caterpillar was found on jasmine is interesting and worthy of record. It is described in Leaflet No. 60.

Wheat Bulb Fly.—During November and December last specimens of wheat attacked by the Wheat Bulb fly (*Hylemyia coarctata*) were received from Dorchester, Southampton, and Shoreham (Sussex). In the two latter cases the maggots were found at work during the first half of November, an unusually early date. As they feed inside the plant, they are well protected, and thus very difficult to combat. All that can be done in the case of a severe infestation is to plough the crop deeply under, in order to bury the maggots effectively and thus prevent them reaching maturity and causing a fresh infestation another year. Where the attack is not widespread a stimulating dressing may usefully be given in order to help the plants over the danger.

Bulb Mite.—This pest (*Rhizoglyphus echinopus*) is dealt with in Leaflet No. 136, but the following further information may be useful to growers.

The Bulb Mite, though most usually found in bulbs, may attack other plants, and the following list of possible host plants is given by Michael, the best authority on this pest:—Fleshy bulbs of hyacinths, tulips, eucharis lilies, onions, and other related bulbous plants, potato tubers, dahlia tubers, oats, roots of vine, and the under-bark of dead trees. "It will," says Michael, "attack almost any sort of underground fleshy root that is not too deep in the ground." It will readily

* Notes dealing with the specimens submitted to the Board for identification will appear in this *Journal* month by month. The notes commenced with the issue for June, 1907.

be understood that the large number of possible host plants greatly increases the difficulty of combating the pests.

There are no records of the mites living in the soil during the winter apart from food plants, but it is not impossible that this is occasionally the case. There is a stage in the life-history, though it does not occur in the development of every individual, known as the hypopus stage, which is a protective condition in which the mite can endure extremes of temperature and of drought which would be fatal to it in any of its active stages. In this stage advantage is taken of passing animals to which the hypopus fixes itself and is so distributed.

Generally speaking, infected soil should not be used, at any rate without sterilisation; and on a large scale sterilisation or disinfection of the soil would be too expensive, even if practicable. On a small scale the soil might be baked or disinfected with bisulphide of carbon.

Practically nothing can be added to the treatment suggested in the leaflet. Immersing the bulbs in a solution of liver of sulphur (1 oz. to 1 gallon of water), when lifting them in July would be fatal to all the mites that were external and came within the reach of the mixture. Unfortunately, some of the mites get well into the bulb, and are thus likely to escape the treatment, and afterwards to become the founders of new colonies. Treatment of the lifted bulbs with bisulphide of carbon might give more successful results, as the fumes are penetrating.

A Carnivorous Worm.—In September the Board received from Hampton-on-Thames some specimens of a flat worm which, it was stated, were found in a greenhouse where there was plenty of moisture, and in which the temperature was never lower than 50° F., and often up to 80° F. or 90° F.

These worms were found on examination to be *Bipalium kewense* (Moseley), a species which may measure up to nine inches and over in length. *B. kewense* belongs to the section of free-living flat worms known as *Turbellaria*, and to the Order TRICLADIDA. The *Turbellaria* are carnivorous in diet. *Bipalium kewense* has been introduced to Britain with plants or soil from the tropics. It was found first of all in the plant houses at Kew Gardens, and has since been re-

corded from other parts of Britain. Dr. MacDougall states that he found it years ago in the tropical house at the Royal Botanic Gardens, Edinburgh, and has since then frequently observed it in the same place, a specimen, measuring 18½ inches when fully expanded, being found in the Tropical Fernery in January of this year. MacDougall has also recorded it from hot-houses in Midlothian, Cheshire, and Northumberland. Theobald has recorded it from Blackheath and Lee.

The worm is grey or yellow-grey in colour, with dark longitudinal stripes down the dorsal surface. On the under surface is a groove into which many mucus-glands pour their secretions, and by means of this sticky secretion *Bipalium* is able to cling to the earthworms on which it preys. The head end can be extended as a crescent-shaped plate. Lehnert states that, having fastened itself to an earthworm, *Bipalium* proceeds to extend its pharynx over the front part of the earthworm, whose tissues are then sucked into the pharynx of the *Bipalium*. In Britain this worm does not mature its reproductive organs, and multiplication is by fission.

The investigation of the diseases and insects which attack plants forms an important part of the activities of many of the Agricultural Experiment Stations and Colleges in Germany, and in recent years an effort has been made to centralise a portion of the work in the

Control of Plant Diseases in Germany. Imperial Biological Institute for Agriculture and Forestry, which is attached to the Ministry of the Interior. In 1903-4 also the Plant Diseases section of the German Agricultural Society, which had been established in 1889, was abolished, and its functions were transferred to the Institute. This section had previously issued annual reports reporting on the diseases and insect attacks which had been brought to its notice, and as an example of the extent to which its work had grown, it may be mentioned that the first report, issued in 1893, contained 106 notices of attack, while the number in the twelfth report was 3,904, the information being supplied voluntarily by some 41 local stations distributed throughout Germany. It was recognised, however, that the information

depended more or less upon chance, and could not be relied upon to give a picture of the actual position as regards plant injuries. It was hoped, therefore, that the co-operation of the Government would lead to a more systematic arrangement. The organisation proposed by the Biological Institute contemplates the formation of Central Bureaux or Reporting Stations, with District Reporters, and a body of local correspondents. The Reporting Stations would usually be the Experimental Stations or Colleges dealing with plant diseases in each Province or State, and their duties are to control the work of the subsidiary stations and correspondents; to inform the Biological Institute of the occurrence of new or specially important diseases, to give information and advice, and to supply the Biological Institute annually with material for an annual report based on the statements they receive. The District Reporters are required to have a knowledge of the common diseases, so as to give advice locally, and are to collect information as to the prevalence of insects and pests and to communicate the information to the Central Station. The correspondents are persons connected with rural industries, who undertake to collect and distribute information.

An organisation on these lines has been gradually introduced, and in 1907 there were 14 principal stations in Prussia, with 199 subsidiary centres, together with 12 principal stations in other States of the German Empire. The first report under the new system on the Diseases and Pests of Cultivated Plants was issued by the Ministry of the Interior in 1907, and refers to the year 1905.

Although this attempt to create a network of agencies for the purpose of observing plant diseases all over Germany is still in its infancy, somewhat similar systems had previously been in existence in several States, and these have been more or less incorporated in the new undertaking. In Bavaria at the present time there are 70 information bureaux and 331 correspondents attached to the Agricultural Botanical Institute at Munich. Dr. Hiltner states (*Prak. Blätter für Pflanzenbau*, July, 1908) that by means of this organisation no pest or disease of cultivated plants can occur to any great extent without the Institute being informed, and it has been possible each year to know with tolerable accuracy the area of distribu-

tion and the severity of the attack of the principal diseases. Preventive measures are taken as far as possible, and information is circulated by means of publications of all kinds.

The Board have been furnished with the following note on the occurrence of bracken in Scotland by Mr. James Ritchie, Birkhill, Stirling.

Eradication of Bracken. The Great Strath—Strathmore—in Scotland, comprising many smaller straths and glens, named after the streams and rivulets passing through them, extends in a north-easterly direction, practically from Stirling to Stonehaven, intersecting the counties of Perth, Forfar, and Kinross-shire.

Seventy years ago bracken was more in use for litter in this strath than it is now, but ferns were not cut to any large extent, except in dry summers, when straw was likely to be short and scarce.

The pastures then were grazed to a greater extent than they are now by cattle instead of by sheep, and the bracken grew too sparsely for profitable cutting. Experience in those days did not place the manure made with bracken nearly on a par with that made with straw; in this it agreed generally with the conclusions arrived at in the article on the use of bracken as litter in the October number of this *Journal*.

Agriculturists in Scotland, however, are more interested in the question how to get rid of bracken altogether, and, in this connection, the change in the prevalence of bracken which seems to have taken place in Strathmore may be of interest. It may be illustrated by the example of one particular farm.

On the western boundary of Strathmore, near the middle of it, is a mixed grazing and arable farm, carrying some 800 black-faced sheep, and requiring three pairs of horses to work it; and between the foothills here and the arable fields on the lower ground are about 100 acres of grassland, light hazel loam, overlying boulder clay subsoil, which has never been under the plough, and for generations prior to 1840 had been grazed year by year with young black Highland cattle—stirks and two-year-olds. The whole of this area then grew

good rough grass, and over all of it a considerable quantity of broom, some of the broom being about six feet high, in which it was often difficult for the herdsman to find his stirks when he wanted to drive them home, but on which they seldom failed to thrive. Ferns grew here, too, but not generally over all of it, and very sparsely anywhere, making it not worth while to cut them for litter, except on one or two limited spots, and to no appreciable extent did they interfere with the grazing.

About this time a son succeeded his father in the tenancy of this holding, who inclined to rearing sheep in preference to cattle, and who afterward grazed this ground with sheep instead of cattle, to the end of his lease, and with the result that the broom was eaten down by the sheep more or less at all times, but especially during snowstorms and wintry weather, until it entirely disappeared, when the broom was succeeded by a general covering of bracken all over the ground, under which the grass is thin, wiry, short, and in dry years is burned up.

This may be an uncommon practical experience, but if not, it would be most interesting on such soils to see the experiment tried of banishing the sheep, reverting to grazing with cattle, and ascertaining whether richer grass, with or without broom, would not follow the change of practice along with the gradual diminution of the objectionable bracken.

The work of the Royal Commission on Tuberculosis (Human and Bovine) has, since the date of their Second

Report of the Tuberculosis Commission. Interim Report (see *Journal*, March, 1907, p. 740), been mainly directed to determining the special characters of tuberculosis in the first

the bacilli which are the cause of tuberculosis in animals other than the cow, and the relationships of the different types of tubercle bacilli encountered in man and certain of the lower animals. The investigations bearing on these and other matters referred to in that Report are not yet complete, and the publication of the results obtained is therefore postponed.

In the meantime a Third Interim Report * has been issued

containing an account of certain experiments carried out regarding the infectivity of the milk and faeces of naturally infected tuberculous cows, *i.e.*, cows that have contracted the disease in the ordinary way.

In the Second Interim Report the Commissioners expressed the opinion, as a result of their investigations, that a very considerable amount of disease and loss of life, especially among infants and children, must be attributed to the consumption of cow's milk containing tubercle bacilli.

Tuberculosis involving the udder is comparatively common in cows, and in such cases their milk always contains tubercle bacilli, and is therefore dangerous for human beings consuming it. It was, however, undecided what was the danger, if any, attaching to the milk of tuberculous cows in which the udder presents no evidence of disease, but a number of observations and experiments bearing on this point have now been made. The experiments were made with the milk of cows which had contracted the disease in the natural way.

In natural tuberculosis in the cow, cases which show such obvious symptoms of the disease as emaciation and cough should be considered separately from the cases in which there are no such signs and in which the disease is to be recognised during life only by means of the injection of tuberculin. None of the cows investigated showed any sign of disease of the udder during life, and in all, after slaughtering, the udder was carefully examined for tuberculous lesions and tubercle bacilli. No tuberculosis was found except in one case, in which one-quarter of the udder showed four small nodules. These could not possibly have been detected during life.

It was found that the milk of the cows obviously suffering from tuberculosis contained tubercle bacilli whether the milk was obtained in the ordinary way or was withdrawn from the teat by means of a sterilised catheter. The presence of tubercle bacilli in the milk of cows clinically recognisable as tuberculous confirms the opinion expressed in the Second Interim Report that the milk of such cows must be considered dangerous for human beings.

The experiments which the Commission have carried out with regard to the infectivity of the faeces of tuberculous cows were dictated by knowledge of the fact that dirt of various

kinds from cows and the cow-shed is almost constantly present in milk as it reaches the consumer. Cows suffering from extensive tuberculosis of the lungs must discharge considerable numbers of bacilli from the air passages in the act of coughing, and some of the bacilli thus expelled may find their way into the milk. But these experiments indicate that the excrement of cows obviously suffering from tuberculosis of the lungs or alimentary canal must be regarded as much more dangerous than the matter discharged from the mouth or nostrils. Even in the case of cows with slight tuberculous lesions, tubercle bacilli in small numbers are discharged in the faeces, while as regards cows clinically tuberculous the experiments show that the faeces contain large numbers of living and virulent tubercle bacilli. The presence of such tuberculous cows in company with healthy cows in the cow-shed is therefore distinctly dangerous, as some of the tubercle bacilli which escape from their bodies in the excrement are almost certain to find their way into the milk.

The experiments made on behalf of the Commission were carried out by Dr. F. Griffith, and the methods adopted and the details of the experiments are given in the appendix to the Report.

MALTA.—According to Regulations dated 2nd January, 1900, live stock imported into Malta must be accompanied by a certificate from the British Consular Authority, or, where there is no such authority, from the Local Government Authority, stating the exact number of animals shipped, and the date of shipment. The importation of cattle from places infected with cattle plague or pleuro pneu-

**Live Stock Import
Regulations.***

* Live Stock import regulations have been published in this *Journal* for the following countries:—United States, Sept., 1906, and Sept., 1907; Argentina, Jan., 1905, April, 1905, Oct., 1905, and June, 1906; New South Wales, April, 1905; Germany, May, 1905; New Zealand, June, 1905; South Australia, July, 1905; France, Aug., 1905; Belgium, Sept., 1905; Uruguay, Oct., 1905; Victoria, Nov., 1905; Spain, Dec., 1905; Queensland, Jan., 1906; Western Australia, Feb., 1906; Tasmania, March, 1906; Transvaal, June, 1906; Ceylon, Cape Colony, Sept., 1906; Holland, Malta, Oct., 1906; Austria-Hungary, Nov., 1906; Russia, Hungary, Dec., 1906; Iceland, Italy, India, Feb., 1907; Isle of Man (sheep), Ireland, March, 1907; Canada, Isle of Man (swine), Jamaica, April, 1907; Norway, Sweden, Isle of Man (sheep), July, 1907; British Isles (horses), Nov., 1907, Feb., 1908; Natal, Dec., 1907; Cuba, Philippines, Oct., 1908; Canada, Algeria, Argentina, Cape Colony, Jan., 1907.

monia, and of any animals from places infected with anthrax in an epidemic form, is prohibited. Horses, asses, and mules are to be kept in quarantine until the Government Veterinary Surgeon is satisfied that they are not infected with disease. The Government Veterinary Surgeon may subject any animal on arrival to any test at the expense of the owner or importer to ascertain whether such animal is infected with disease.

Dogs are to be kept under observation in the quarantine station or other approved place for not more than six months at the owner's cost. This provision may be dispensed with in the case of performing dogs and dogs intended to be re-exported within forty-eight hours.

MOZAMBIQUE.—According to the General Stock Regulations approved by Government Order, No. 113 of 1908, the importation of live stock is prohibited without previous inspection and authorisation by the Veterinary Department. Persons wishing to import domestic animals must apply to the Veterinary Section of the Government for authority, stating the number and species of the animals, place of origin, destination, and purpose for which they are imported. Animals may be detained in quarantine at the charge and risk of the importer for such time as the Veterinary Service considers necessary. Cattle are to be tested with tuberculin and horses with mallein, and animals reacting positively are to be slaughtered without compensation. Animals which react suspiciously are to be detained in quarantine pending further investigation.

The Government Order referred to above states that experience has demonstrated that the Province of Mozambique is eminently adapted to the breeding of cattle and other domestic animals. The vast herds which twelve years since covered the plains in part of the province have been largely destroyed by disease, and with a view to restocking the Southern districts a Veterinary Service has been established for the purpose of eradicating and controlling animal diseases. An experimental station is to be established in the district of Lourenço Marques for the study of the conditions of acclimatisation and improvement of various species, and animals not required by the station are to be sold annually by public auction.

During a period of two years from March, 1908, animals for breeding purposes, materials for the fencing of land and for the construction of stables, tanks, and other accessories, and insecticides for the destruction of animal parasites, are to be transported over the State Railways gratuitously.

ISLE OF MAN.—By a proclamation dated 4th January, 1909, the importation into the Isle of Man of cattle, sheep, swine, and goats from any place other than the United Kingdom and the Channel Islands is prohibited.

An inquiry has recently been addressed to the Board as to the food necessary for cattle during ocean voyages in order to land them, at as moderate an outlay

Rations for Live Stock on Ocean Voyages. as possible, in good healthy condition. It is considered that the following rations would be suitable for full-sized

cattle weighing about 1,500 lb.:—14 lb. hay, 7 lb. straw (cut up), 5 lb. crushed oats, 3 lb. bran, 1 lb. crushed linseed. On alternate days 10 lb. of mangolds might with advantage be given in place of the ground linseed, when a little less hay would be required. Cattle of less weight would naturally require less food. For an animal weighing about 1,000 lb., 10 lb. hay, 5 lb. straw, 3 lb. oats, 2 lb. bran, and $\frac{2}{3}$ lb. linseed would be suitable.

The ration required by full-sized cattle would be enough for five large or six small sheep, but a daily allowance of roots instead of the linseed meal would probably give more satisfactory results.

A reserve of fodder is necessary to allow for possible delays.

There is little opening in Egypt for the importation of live stock generally, though English horses in limited numbers

Importation of Live Stock into Egypt. are sometimes imported for stud purposes, as well as for carriage horses.

A report by Mr. W. H. Cadman, B.Sc., F.C.S., of the Khedivial College, which is printed in a recent Foreign Office Report (Annual Series, No. 4,127), furnishes the following information on the subject:—

Cattle Breeding.—The Egyptian farmer still neglects the

breeding of good cattle suited to the land and conditions of the country. Nearly all the ploughing and cultivation is done by oxen, but good working cattle are very scarce and dear in Egypt. This is largely due to the absence of natural pasture, which is essential to economical cattle breeding; the farmer buys his cattle from the smallest holders of land. The latter are the chief stock raisers in Egypt, being able to rear cattle in small numbers by feeding them on rough herbage along the canal banks and elsewhere. It is not surprising therefore that the fellahs lack knowledge of the breeding, selection, and rearing of cattle.

A Breeding Commission has been appointed and is establishing a stud farm in the neighbourhood of Ghizeh. Several thoroughbred horses and sheep have already been imported from the United Kingdom.

The importation of European stud bulls is being avoided on account of the difficulties of acclimatisation, and Mr. T. P. Goodchild maintains that such crossing would not only be risky, but would probably lead to a reversion to animals good for neither meat, milk, nor work. The Commission is therefore selecting the fittest bulls from local shows and elsewhere with the object of producing stronger and more thrifty animals by getting rid of the most glaring faults. It is intended later to establish breeding centres for different districts, and so to provide animals for breeding purposes after the manner of the Indian Government.

Poultry and Eggs.—At present both fowls and eggs are scarce in Egypt. There is no prospect of poultry farming in this country until the character of the local fowl typhus is discovered, to which even native fowls succumb.

After an interval of thirteen years a census of live stock has been taken in the Argentine Republic, and, in view of the growing importance of that country

Number of Live Stock in Argentina as a factor in the world's meat supply, the figures are of considerable interest.

They show generally that the stock of cattle has increased by one-third, while sheep, on the other hand, have decreased by about 10 per cent. The increase in the number of cattle is distributed over all parts of the Re-

public, though it occurs chiefly in the Provinces of Buenos Aires, Santa Fé, Corrientes, and Cordoba, and it would seem that this increase has been to some extent secured by a displacement of the sheep. This is particularly noticeable in the Province of Buenos Aires, where, on the one hand, the stock of cattle has risen from 7,746,000 to 10,351,000, while on the other the stock of sheep has diminished from 52,630,000 to 34,605,000. Decreases in sheep are also recorded in Santa Fé, Cordoba, Jujuy, and Pampa Central, but in all other parts there has been an increase in the sheep stock, though it has not been sufficient to counterbalance the very heavy diminution in Buenos Aires. It seems fairly evident, however, that there has been a marked transference of the sheep-breeding industry from the more thickly populated districts, where land has risen in value, to the interior and less-cultivated regions. Some of the Territories, such as Rio Negro, Nenquen, Shubut, Santa Cruz, and Tierra del Fuego, which in 1895 only carried about 1,800,000 sheep, now return in all 11,250,000 head.

According to a summary in the *Buenos Aires Standard*, the total figures for the three national censuses are as follows :—

		In thousands.		
		1888.	1895.	1908.
Cattle	21,964	21,792	29,117	
Sheep	66,701	74,380	67,212	
Horses	4,263	4,446	7,532	
Pigs	403	653	1,404	

Of the cattle, 984,000, or nearly 3·4 per cent., are classed as pure-bred, 15,060,000, or 51·7 per cent., as cross-bred, and 44·9 per cent. as native; 1,179,000 sheep, or 1·75 per cent., were pure-bred, 55,449,000, or 82·5 per cent., were cross-bred, and 15·7 per cent. native.

The Board have received a request from a firm of wholesale provision merchants to be supplied with particulars of the best centres for purchasing and packing large quantities of English and Welsh eggs. This firm state that they are importers of the best grades of Irish and Continental eggs, but find that English new-laid eggs are in demand, and suggest that English producers would be benefited by coming into contact with the regular channels

through which the great bulk of the eggs arriving in this country are being supplied to the public. The name of the firm in question can be ascertained on application.

The late Mr. John Innes, of Merton, in Surrey, who died in 1904, left a large sum of money for various charitable objects, one of which was the foundation of a school of horticulture. A scheme for the administration of the charity has been prepared by the Charity Commission, and has recently been published. The scheme provides for the payment by the trustees of yearly sums out of the income of the charity for the maintenance of a park and a boys' club at Merton, for the provision of scholarships tenable at a local school, and for other charitable objects. With the exception of these sums and certain annuities left by the late Mr. Innes, which together amount to an aggregate yearly sum of about £4,400, the residue of the estate, which is estimated to produce about £5,000 per annum, will be applied to the purposes of an institution, to be called the John Innes Horticultural Institution, for the promotion of horticultural instruction, experiment, and research. For the purposes of the institution the house formerly known as the Manor Farm, Merton, and such portion, not exceeding two acres, of the grounds as the trustees may select, will be used, and in addition the trustees are empowered, subject to the approval of the Charity Commissioners, to provide further land, of which a sufficiently large acreage in the immediate neighbourhood is available.

The institution will be placed under the management of a Council consisting of three trustees (*ex-officio* members) and nine representative members. Two of the representative members will be appointed by the Board of Agriculture and Fisheries, and one by each of the following :—the Royal Horticultural Society, the Fruiterers' Company, the National Fruitgrowers' Federation, the Hebdomadal Council of the University of Oxford, the Council of the Senate of the University of Cambridge, the Senate of the University of London, and the Governing Body of the Imperial College of Science and Technology.

The functions of the Council are defined in the scheme for the administration of the charity as follows :—

- (a) To establish and maintain the institution for the purposes of affording practical and scientific training for those engaged, or desiring to be engaged, in the industry or employment of horticulture.
- (b) To carry out investigations and research, whether of a practical or scientific nature, into any matters having reference to the growth of trees and plants generally, but especially of fruit trees, shrubs, fruit, vegetables, and flowers, and to investigate and demonstrate the best methods of their cultivation, their habits and leading characteristics, together with the soils and localities in which they may be most inclined to flourish.
- (c) To endeavour to improve existing varieties, or to create and introduce new ones.
- (d) To impart information, whether of a practical or scientific character, on all matters connected with the above, and generally to endeavour to promote as far as may be in every way the interests of all connected with, or desiring to be connected with, the industry or employment of horticulture.
- (e) Generally to pursue any course incidental or conducive to the attainment of the objects referred to in paragraphs (a), (b), (c), and (d) of this clause.

A further Reference was added in March, 1908, to the original terms of reference of the Royal Commission on Coast Erosion, viz., "to inquire whether

**Report on
Afforestation.** in connection with reclaimed lands or otherwise it is desirable to make an experiment in afforestation as a means of increasing employment during periods of depression in the labour market, and if so by what authority and under what conditions such experiment should be conducted."

A Report * has now been issued by the Commission dealing

* Second Report (On Afforestation) of the Royal Commission on Coast Erosion, Cd. 4460. Price 6d.

with this question, in which the conclusions and recommendations are summarised as follows :—

Advisability of Afforestation in the United Kingdom.—The natural conditions of soil and climate in the United Kingdom are favourable to the production of high-class commercial timber such as is annually imported into the country in very great quantities.

The afforestation of suitable lands in the United Kingdom, if undertaken on an adequate scale and in accordance with well-recognised scientific principles, should prove at present prices a sound and remunerative investment.

In estimating the profits of sylviculture account must, moreover, be taken of two facts: the increasing consumption of timber per head of population all over the world, in spite of the introduction of alternative materials; and, further, the exploitation, waste, and destruction by fire of the virgin forests, especially those yielding the more important building timbers. Already a noticeable shortage of timber supply has resulted, as is evidenced by steadily rising prices and depreciating qualities in all markets. It seems impossible to escape from the conclusion that this tendency will be continued and accentuated, and that a steady and a very considerable rise in prices may be looked for throughout the present century. The security which afforestation offers for investment is therefore likely to be an improving one, with a corresponding increase in profits, but, to avoid all that is speculative, this prospect has been disregarded in framing the estimates made by the Commission.

Nature and Extent of Land Suitable for Afforestation.—The amount of land suitable for afforestation, but not now under timber, in the United Kingdom may roughly be put at a maximum of 9,000,000 acres. In determining this figure two considerations have been taken into account, besides elevation and physical suitability of soil. The first is that the value of the land is not in excess of a sum on which a fair return may be anticipated on the expenditure. This will naturally vary according to the productive capacity of the soil and the crop which it will carry. The second consideration is that the land could not be more profitably utilised in any other way.

A forest of 9,000,000 acres, in which are represented the various series of age-classes, may be expected to yield 9,000,000 loads annually in perpetuity. The importation of foreign timber from temperate climates into the United Kingdom in the year 1907 exceeded 8,500,000 loads, or approximately the annual supply which could be expected from the afforestation of the above-mentioned area.

The withdrawal of 9,000,000 acres from its present uses would cause some gradual curtailment of food supplies and displacement of labour. Land suitable for afforestation is mostly devoted to the production of mutton. Calculations on the basis of the present consumption show that at most 60,000 tons, or 4·8 per cent. of the total home production of meat, or 2·6 per cent. of the present national consumption, would be ultimately displaced. As to labour, the employment furnished by the present uses, mostly sheep farming, to which the land in question is devoted, may be taken to average one man to 1,000 acres. This does not represent one-tenth of the permanent employment afforded by the maintenance of a similar area of land under forest.

Systematic sylviculture aims at the production of a steady and continuous supply of marketable timber. To ensure the maintenance of these supplies the area should be divided for planting by the average number of years which the crop needs to mature; for example, if the life of the crop be taken as eighty years, the area to be afforested every year would, out of a total area of 9,000,000 acres, be 112,500 acres. But a more rapid system of planting may be adopted without seriously complicating the rotation, and, further, some adaptation to the temporary fluctuations of the labour market is feasible.

The distribution of this 9,000,000 acres of suitable land is somewhat irregular. By far the largest areas are to be met with in the West and North of England, and throughout similar regions in Scotland. Ireland and Wales also contain a relatively large amount of this type of land. In the South and East of England, on the other hand, the areas in the aggregate are less extensive. Great diversity exists in the size of these areas, some counties offering large contiguous stretches, while in others the areas are characterised by their discontinuous nature.

Administration.—The administration of national forest lands should be entrusted to special Commissioners. In dealing with these lands, sub-division into distinct districts, with an executive and administrative sub-centre, commends itself from various points of view. Thus local employment would be afforded, local subsidiary industries would be encouraged, public recreation grounds would be provided, and, in connection with the establishment of such forests, small holdings would undoubtedly be multiplied.

Afforestation as a State Enterprise.—Sylviculture in the United Kingdom is an enterprise which rarely appeals to the private landowner or capitalist. The prolonged time for which capital must be locked up before any return can be expected, the loss of rent and burden of rates over the whole period, and the absence of security for continuous care and management, act as deterrents. None of these objections applies to the State, whose corporate life and resources lend themselves in an especial degree to an undertaking of this character. If the State plants, it will certainly reap, which the individual owner can rarely hope to do.

Process of Afforestation.—If afforestation be promoted on a large scale, the provision of suitable lands is the first step. For this purpose a general survey should be made, and the extent and distribution of such lands ascertained. As a rule it will be found expedient for the State to purchase from time to time such areas as are destined for planting, but some progress may conceivably be made along the lines of profit-sharing, in which case the owner would forgo the purchase price. Experience proves that, although much of the land required may be expected to be purchasable by voluntary treaty, yet compulsory powers would be necessary to facilitate transactions where voluntary treaty had broken down. The principle laid down in the Small Holdings Act of 1907 for the acquisition of lands should govern these proceedings, as to arbitration, restrictions and safeguards. Where private owners can satisfy the Forest Commissioners that they are able and willing to afforest, under their supervision and to their satisfaction, and give an undertaking to that effect, compulsory powers should not be enforced against such owners so long as that undertaking is fulfilled.

Financial Aspect of the Afforestation Schemes proposed by the

Commission.—The value of land falling within the definition of "suitability" may be taken, except in rare instances, to lie between £2 and £10 freehold value; but the average value of suitable lands, including the necessary buildings and other preliminary equipment, may be taken at £6 10s. per acre, and the average cost of afforestation also at £6 10s. per acre. If 150,000 acres be annually taken in hand, a sum of about £2,000,000 would be needed annually to finance the undertaking.

Money expended in afforestation differs in kind from other calls on the national purse. It is a productive investment of capital. To provide this capital sum out of taxes would be an act of unprecedented generosity on the part of the present generation of taxpayers in favour of their posterity. No stronger justification for proceeding by loan than a reproductive outlay exists. The loan should be based on actuarial calculation showing initial cost, expenses of upkeep and management calculated at compound interest over the whole period, and the value of the property when fully matured. Such actuarial statements are given in the Report, and show, for the full scheme, that, after allowing 3 per cent. compound interest on all the capital invested, the approximate equalised revenue would at the end of eighty years amount to £17,411,000 per annum, while the value of the property might be expected to be £562,075,000, or £106,993,000 in excess of the sum involved in its creation. A smaller scheme involving the afforestation of 6,000,000 acres (75,000 acres annually for eighty years) would show a profit of about £10,000,00 annually, or a capital value of £320,000,000, being £60,944,000 in excess of the cost of production.

Coming to ways and means by which a loan of this character may best be provided, a point of great importance to be borne in mind is that, although the period of rotation of a timber crop may be taken as eighty years, yet, after forty years, owing to the value of thinnings, and the receipts of some short-period crops, the forest becomes practically self-supporting. Between the fortieth and eightieth years the sales of timber will be sufficient to meet the annual charges, including the upkeep and the extension of the forest. After the eightieth year a large annual revenue will be derived. These considerations point to a free loan from the Treasury to the Forest Commissioners; the net deficit to be met would in the first year be £90,000 or £45,000, according to the extent of the operation, and would reach its maximum in the fortieth year, amounting in that year to £3,131,250 or £1,565,625. After this period the deficit would be insignificant, while in the eighty-first year the revenue derived would be £17,411,000 or £10,000,000 respectively, representing about 3½ per cent. on the total accumulated costs of the undertaking.

Unemployed Labour in Relation to Afforestation.—On the question of labour and its relations to forestry, the evidence shows that the operations involved in afforestation vary in the degree of requisite skill from little or none in rough road-making and surface draining to a considerable amount in the planting. The Commissioners wish to make it clear that they have in contemplation a scheme of national afforestation on economic lines. They have no hesitation in asserting that there are in the United Kingdom at any time, and especially in winter, thousands of men out of work for longer or shorter periods, who are quite ready and able to perform the less skilled work without previous training, and with satisfactory results. There is a still larger

class of unemployed who are capable of being trained to perform this or the higher class of labour, and such men can, if desired, be recruited through labour colonies, distress committees, labour bureaux, or charitable agencies. There is, then, no need to accept inefficient labour with the object of affording occupation to the unemployed. The labour employed in the national forests should not fall below the ordinary standards, and should be remunerated at the ordinary rate of the district for similar labour. Subject to the requisite standard of efficiency being attained, preference should be given to those temporarily or permanently unemployed in the district, especially where evidence of such efficiency can be furnished by public or private agencies for the reclamation and training of the unemployed class.

To establish afforestation on commercial lines does not, however, preclude its being used as an instrument of social regeneration. A broad view of economics cannot exclude from its cognisance the grave national charge which unemployment with all its concomitant results involves, to say nothing of the personal deterioration by which it is often accompanied. Sylviculture is not unsuitable for building up the moral and physical fibre of even the most depressed of the unemployed classes, and its agency may well be invoked for this purpose, and advantage taken of its healthy and wholesome influences, provided that any additional expense incurred by the employment of less efficient labour be defrayed from a separate account.

In estimating the amount of employment furnished by afforestation, it is well to distinguish between the temporary labour involved in the creation of the forest and the permanent labour needed for its maintenance. Taking varying circumstances into consideration, it may be said that, on the average, it will take twelve men to afforest 100 acres in the planting season of four to five months, and that every 100 acres afforested will provide permanent employment for at least one man. If 150,000 acres be annually taken in hand, the labour of 18,000 men will be needed, and permanent employment will in due course be afforded to 1,500 men, rising by an additional 1,500 every year until the end of the rotation. The number permanently employed would then approach 100,000. The labour absorbed by felling and converting timber, to say nothing of subsidiary industries which spring up around a timber supply, has been considered too remote to warrant detailed estimation, but there is undoubtedly a large field of employment in this connection. It is important to remember that, on the basis of £1,000,000 being annually spent on the operations of afforestation, apart from the cost of the land, employment would be afforded, directly and indirectly, to many more than 18,000 men. Indeed, the number employed may be roughly taken to be represented by about double that figure, for the incidental occupations, such as building, the making of implements, the provision of materials, etc., all involve the employment of additional labour.

Effect on Existing Industry and Agriculture.—A special advantage of forestry in relation to labour is that it offers a new source of employment. The labour connected with timber and timber products imported into the country is performed abroad, and thousands of families are maintained on the produce of the labour associated with the timber industry. Another advantage bound up with the extension of sylviculture is that the market for its produce is so great that it is inconceivable that it could seriously interfere with the output from

private woodlands, and no difficulty of competition between the State and individuals need be apprehended.

The acquisition of grazing areas, private or common, for sylviculture might necessitate a modification of the existing agricultural system on certain farms. It is unreasonable to suppose that the remaining lowland areas on such farms could not, in many cases, either be adapted to other forms of agriculture, or be profitably utilised for small holdings. Further, the conversion of comparatively unprofitable lands into forests enhances the productiveness of the adjacent areas, and should materially assist the small holdings movement. It has also the advantage of furnishing winter employment to small holders.

In view of the foregoing conclusions, the Commission recommend that

(1) Parliamentary powers be obtained to:—

(a) Appoint Commissioners charged with the duty of carrying out a national scheme of afforestation;

(b) Vest in them power to survey and determine what land falls under a statutory definition of "suitability," and to acquire such land as from time to time may be required for afforestation or purposes incidental thereto;

(c) Equip the Commissioners with compulsory powers for the acquisition of such land on the precedent of the Small Holdings Act, 1907, so far as applicable, subject to the reservation of certain rights to private owners;

(d) Authorise the Treasury to grant the Commissioners an annual free loan for the necessary period.

2. (a) The Commissioners should prepare a general scheme of afforestation for the whole of the contemplated area extending over the entire period of rotation;

(b) An actuarial statement should be supplied by them to the Treasury, indicating when and in what manner the loan and interest would be repaid;

(c) The afforestable area should be divided into convenient sub-districts;

(d) Work should be commenced in each, or as many as convenient, of the districts in such a way as to provide that the earlier operations, which may be regarded as experimental, should be capable of determination or of forming part of the complete forest scheme for each district.

The Board of Agriculture and Fisheries have been supplied through the Foreign Office with some information, of which

a summary is given below, respecting

Afforestation of Waste Lands in Denmark, Holland, France, and Belgium. This information was originally obtained at the request of the Irish Department of Agriculture on behalf

of the Irish Forestry Committee.

Denmark.—Mr. Vice-Consul Funch states that no fixed grant is made by the State in Denmark for the acquisition of waste lands, but between 1867 and 1892 about 42,000 acres on the Jutland moors and 1,450 acres in Seeland were purchased at a cost of £42,780. The expenses incurred in planting the above-mentioned areas in Jutland, and those which in previous years had been acquired in the same Province, have in recent years amounted to £3,300 annually, in addition to about £600 per annum for fencing, roads, &c. Tree planting on the dunes along the coast of Jutland, for the purpose of protection from drifting sand, is, however, continually going on, and the expenses during the last twenty years have averaged about £3,300 for purchase, and £11,100 for planting.

As regards the purely waste lands there are four types which can be separately distinguished.

(1) The areas of argillaceous gravel and sand, covering the Bornholm granite, are principally planted with the Silver Fir (*Abies pectinata*), with oak on the lower-lying clay. These plantations are protected with firs (*Pinus sylvestris*), alder, and birch, until they reach a height of 10 or 12 feet, when the shelter trees are removed. On some other poor soil areas red pine (*Picea excelsa*) and *Pinus sylvestris* are planted.

(2) Woods have been laid out on the large moors of Jutland where the soil consists entirely of poor gravel and sand covered with peat. The climate here is generally inclement, with strong gales from the west and a heavy rainfall. The principal tree planted is the red pine. In districts where the peat is of recent formation and the areas have previously been covered with wood, these trees grow freely, and no treatment is necessary. On the older heath, where "hardpan" has developed, and where the peaty layer is sour, previous cultivation is required. The overlying vegetation is first burnt, and the land is then ploughed repeatedly, at first lightly and afterwards deeply, so as to break up the layer of "hardpan." After being harrowed repeatedly, it is allowed to remain fallow for two or three years before planting. Between the firs, mountain pines are planted as "nurses" until the firs are 10 or 12 feet high, when most or all of them are removed. Of late the preparation of the ground with artificial manure

containing potash and phosphoric acid with lime has been practised with success, and also green manuring with lupins. The existence of old pine forests shows that the soil is capable of producing good pine wood, and experiments are being made with certain species of firs, *Pinus sylvestris*, and several species of American firs, but so far the results derived from *Pinus montana*, var. *uncinata*, are the only ones which can be called fairly satisfactory.

(3) Along the coast line of the North Sea and on certain areas along the eastern coast of Jutland extensive dunes of white sand are found, which are either entirely destitute of vegetation or planted with sand grasses. The principal tree used here is *Pinus montana*, several varieties of which are grown. The straight type from the Pyrenees and the South of France gives results which, from an economical point of view, may be called fairly satisfactory. In the depressions in the dunes, where moisture accumulates, the *Picea alba* is also used, as well as other coniferous trees, birch and oak. These trees are not, however, of much value, whereas the mountain pine produces good firewood, and can also be used for pit props.

Grants are made annually to the Danish Heath Society, the special object of which is to encourage tree-planting in Jutland. The amount allowed, as a rule, for each separate plantation is one-third of the outlay for cultivation, fences, roads, &c. The revenue of the State Forest Department in 1906-7 was £82,900, and the expenditure £60,280, leaving a profit of £22,620. During the last ten years the average profit has been £19,000.

Holland.—Sir Henry Howard, H.M. Minister at The Hague, has forwarded a memorandum drawn up by the Netherland Ministry of Agriculture, from which it appears that varying amounts of from £1,000 to £2,000 have been annually included of late years in the State Budget to provide for the purchase of waste lands, while the expenditure on cultivation in 1907 was about £6,700.

There are three types of waste lands on which afforestation is being carried on, viz., the dunes, sand drifts, and heaths. The sand dunes require to be fixed previous to afforestation, and are then planted with either the Black or Austrian Pine

or the Corsican Pine, and with *Pinus montana*. Where the nature of the soil permits, leaf trees, especially oak and alder, are also planted. The pines are generally planted as two-year-old saplings, which have been transplanted once and have long roots, while the leaf-tree saplings are generally two or three years old. The saplings are mostly obtained from State nurseries situated in or near to the grounds which are to be planted. At places where the soil is very poor, experiments on a small scale are being made to improve the soil by growing lupins for green manuring, adding compost, &c.

The afforestation of sand drifts is done much in the same way as the dunes, but *Pinus sylvestris* is chiefly used, with birch and oak. Heathland is more fully prepared, being generally ploughed, after the main drainage ditches (if any) have been dug. Where the soil is naturally loose and open, the preparation of strips of land or the making of holes for planting is sometimes sufficient. Green manuring with lupins, and the subsequent growth of a couple of crops, is also practised. *Pinus sylvestris* is chiefly planted, but on the better soil leaf trees, especially oaks, are frequently intermixed. Strong one-year-old pines with long roots are used, and in the case of oaks two- or three-year-old saplings once transplanted. Attempts are often made to encourage the growth of the pines by applying basic slag and kainit. Experiments with exotic coniferæ are made in many places on a small scale.

The State grants an annual subsidy to a private Association, the Netherland Heath Company, which has for its object the promotion of the cultivation of heaths, dunes, and other waste lands. This subsidy was formerly £440, but now amounts to £750 per annum. This Association gives advice, draws up plans, and carries out the work if desired, but it does not aim at making a profit.

For the promotion of the afforestation of waste lands belonging to communes, the Government have since 1907 granted loans free of interest, and also provided technical assistance. Any commune which owns a sufficient extent of land suitable for afforestation may apply to the Minister of Agriculture for such a loan, or several communes may combine their lands in one application. If the application is approved, a plan of

cultivation is drawn up by the State Forest Administration in consultation with the municipality, and the loan is fixed so as not to exceed £4 per acre, or 80 per cent. of the cost of cultivation. The commune then binds itself to carry out the work under State supervision and in accordance with the plans of cultivation approved by the Forest Administration.

France.—As regards France, the Ministry of Agriculture state that in virtue of a law of 4th April, 1882, dealing with mountainous lands, the State buys each year uncultivated lands in the Alps, Pyrenees, Cevennes, and the Central Plateau, for the purpose of re-afforestation. The extent of land thus acquired up to January, 1907, was 503,000 acres. Grants of money are made, and plants and seeds are supplied to communes, associations, and private individuals to assist them in the work of re-afforestation. The land planted through this public assistance is 249,000 acres.

Exemption from the land tax is granted to owners who afforest their lands, viz.:—Complete exemption during 30 years for sowings and plantings made on the tops and slopes of mountains; and a reduction of three-fourths for all land planted or sown, whatever its situation, during the first 30 years.

Belgium.—H.M. Minister at Brussels states that the sum of £12,000 is annually voted for the purpose of enabling the State to acquire wooded lands or lands fit for planting. When there is an opportunity of purchasing such land, the proposal is laid before the Chambers, who decide if the purchase should be made, and vote an additional grant if required. A sum of £19,500 is also provided for works in connection with the State Forests.

The State does not give financial assistance to private persons with a view to encouraging the planting of trees, except in certain particular cases, such as planting over abandoned mines or quarries, or with a view to screening a blemish on the landscape. In such cases the expense may be partially or entirely borne by the State. The Government foresters are, however, always willing to give any information to private persons regarding forestry. Forests belonging to the communes are managed and inspected by the Forestry Department of the Ministry of Agriculture, and a part only

of the expenses incurred is refunded by the communes. The Government, and in some cases the Provinces, pay a portion of the expenses incurred in planting communal waste lands, or in re-afforesting districts where the communal woods have been destroyed. An exemption from taxes during ten years is granted to communes in respect to waste lands which have been planted with trees. Public lectures on forestry are given free every year in various districts.

For some years past the problem of discovering some means of retaining the poorer agricultural labourers on the land and of improving the conditions of

Provision of Cottages and Allotments in France. rural housing has been engaging the attention of the Legislature in France.

In 1906 a law was passed for the purpose of encouraging the erection of cheap and healthy dwellings for the labouring classes by authorising the loan of official and charitable funds to recognised societies, to enable them to build houses of this type and sell them by instalments over a long term of years, or to lend money for this purpose. The provisions of this law also applied to the acquisition of gardens not exceeding one-eighth of an acre when attached to dwellings, or one-fourth of an acre if detached. Whilst, therefore, this law encouraged the building of cottages with gardens, the limitation of the area prevented agricultural labourers from acquiring under these favourable conditions an allotment of sufficient size to produce much profit. It was pointed out that the lower wages and frequent lack of work prevented agricultural labourers from paying the annual instalments necessary for the purchase of a cottage, though the town workman was well able to do so, whereas if the area to be acquired were made larger the profit obtained from it would suffice to cover the necessary payments, and an important step would have been taken in the direction of preventing the migration of rural labourers into the towns. After considerable discussion, a law was passed on the 10th April, 1908, which extends the provisions of the earlier law in several important particulars.

In the first place, the law of 12th April, 1906, as to cheap

dwellings is made to apply to gardens and fields not exceeding $2\frac{1}{2}$ acres, provided the purchase price does not exceed £48. In addition, the State is authorised to make loans at the rate of 2 per cent. to District Land Credit Societies which lend money for this purpose, and to the Cheap Dwellings Societies formed under the previous Act. These District Land Credit Societies must be limited companies with a minimum capital of £8,000, and must not pay more than 4 per cent. interest to their shareholders. The total amount of the State loan is fixed at £4,000,000. Persons borrowing money from the Societies above-mentioned must (1) possess one-fifth of the price of the land or the house; (2) take out an insurance policy with the "Caisse Nationale d'Assurance" to cover the payment of the balance of the loan in the event of death, the premium for this policy being incorporated with the loan; and (3) obtain certain certificates from the administrative authority showing that the requirements of the law have been fulfilled. The borrower must undertake to cultivate the land himself or by his family. The price paid for land acquired under the 1908 law must not exceed £48. There are certain provisions in the Act of 1906 which enable properties of this kind to be maintained intact for a number of years instead of being divided among the heirs on the death of the owner, and for enabling any one of these heirs to acquire it, thus avoiding its sale to a stranger.

The agricultural crisis which has been felt throughout manufacturing countries during recent years has had its effect

on the Swiss agricultural population.

**State Assistance
to Agriculture in
Switzerland.**

The result of the increased wages in town industries has tended to reduce the number of farm labourers or servants, among whom, more especially the women, there is a tendency to gravitate towards the towns.

Sir G. F. Bonham, H.M. Minister at Berne, in referring to this fact, states that the duty of the Central Government to do what it can to satisfy the wants of the agricultural population is fully recognised. It is felt that with the large foreign element and its situation as a neutral State on the road of international communication, Switzerland more espe-

cially feels the necessity for a permanent class able to guarantee the permanence of its institutions, and to provide recruits for the army.

The intervention of the State in favour of agriculture, apart from measures to prevent cattle disease and phylloxera, was first shown in measures for regulating the mountain streams. This was followed by legislation having for its object not only the regulation of mountain streams, but of the forests from which they are fed. In 1893 a law was passed for the promotion of agriculture by the Confederation, which is based on the principle that the Federal Government should issue laws and regulations, which the Cantons are to carry into effect under the superintendence of, and with subsidies from, the Confederation, to which the Cantons also contribute.

Federal subsidies may be granted in accordance with the above-mentioned law to :—(1) Agricultural instruction by the Cantons. This is generally carried out by means of temporary classes in the winter months. (2) Establishments for research and experiments. These exist in Zurich for agricultural chemistry and the control of seeds. Similar institutions exist at Berne and Lausanne. (3) The improvement of the breed of cattle. The annual sum expended is now £28,000 which is almost exclusively spent on acquiring bulls. (4) Cattle insurance, of which there are two branches: (a) compulsory insurance against cattle diseases, fixed by law; (b) local insurance offices of a uniform type, in which assurance is compulsory for all proprietors. (5) The improvement of the soil, whether by drainage or irrigation. In 1906 subsidies amounting to £34,800 were granted to 308 undertakings of this description. (6) Measures taken by the Cantons against diseases of plants, insurance against hail, &c. (7) Agricultural societies and syndicates. Amongst those which have benefited by State subsidies are the societies for the encouragement of cattle breeding.

There is a large number of agricultural societies which have had considerable influence in determining the votes on economic questions, submitted to the popular vote. They form together a large group, the "Union des Paysans" numbering about 100,000 members. No special facilities are at present afforded by the State for the acquisition of land.

An International Congress of Agricultural Associations will be held at Brussels in September, 1910, in connection with the Brussels Exhibition.

International Congress of Agricultural Associations. It is pointed out in the preliminary programme that the association of growers in societies and unions constitutes one of the most powerful factors in the advancement of agriculture.

The methods adopted in different countries even for the attainment of similar objects vary very greatly, and it is thought that the comparison of the various systems and the discussion of methods in an international assembly will be productive of good results. Some other matters of importance to the grower, such as the improvement of roads and the diminution of agricultural labour will also be included, but the Congress does not propose to touch on technical or economic questions connected with general agriculture or its allied industries.

The Congress will be divided into ten sections as follows :—
(1) Societies representing agriculture or horticulture in general; (2) Farmers' Associations, Societies, or Clubs; (3) Associations for production (cattle and sheep breeding, milk control, improvement of seed); (4) Societies for co-operative manufacture, purchase, export, sale, consumption, &c.; (5) Credit banks and Societies for live-stock insurance and other forms of thrift; (6) Demography and hygiene (including housing); (7) Agricultural labour; (8) Means of transport; (9) Other measures for the improvement of the condition of the agriculturist, including public lighting and water supply, public amusements, diffusion of small holdings, rural housing, market gardening for workmen, &c.; (10) Organisation of inquiries, shows, and exhibitions, distribution of information by agricultural societies, &c.

Societies or private persons can participate in the Congress, the subscriptions for each person or representative being 15 francs. The office of the Congress is located at 220 Chaussée d'Alsemberg, Brussels.

Co-operation is a very important factor in agricultural and industrial life in Austria, and the movement enjoys the continual support, both of the Provincial

Credit Banks in
Austria.*

Governments and of the local authorities. Among the various forms of co-operation probably none is more widely

spread or more generally utilised than the Credit Banks. These are established on the principles which have proved so successful in Germany, viz., the Schulze-Delitzsch and the Raiffeisen systems. The former system is adopted chiefly by the industrial classes, being intended mainly for the benefit of mechanics, artisans, and small tradesmen, while the latter system confines its operations exclusively to the rural population. The Schulze-Delitzsch banks were originally based on the principle of the unlimited liability of the members, but limited liability has also been introduced, and has in recent years largely supplanted in Austria unlimited liability in societies of this type. Loans are granted to members and to some extent to non-members also, without inquiry as to the purposes for which they are required, on security, which may take the form of mortgages, guarantee by another member, bills of exchange, &c. They are only granted for short terms. Deposits are received from members and from other persons, and these, together with the subscribed capital and the reserve funds, form the source from which loans are made.

The Raiffeisen banks, on the other hand, rest entirely on the principle of unlimited liability. The money for working the Society is obtained to a small extent from entrance fees and subscriptions, but chiefly from deposits and from money borrowed from persons outside the Society on the collective security of the members. Loans are only advanced for reproductive purposes, and must be guaranteed by two other

* Articles on Agricultural Credit abroad have appeared in previous numbers of this *Journal* as follows:—"Agricultural Credit Banks," May, 1905, p. 96; "Agricultural Credit in France," June, 1905, p. 149; "Agricultural Credit in Hungary," July, 1905, p. 210; "Agricultural Credit in Belgium," August, 1905, p. 279; "Agricultural Loans in Queensland," September, 1905, p. 375; "Agricultural Credit in Germany," March, 1906, p. 725; "Agricultural Credit in Denmark," May, 1906, p. 118; and "Agricultural Credit Banks in Cape Colony, Natal, Transvaal and Western Australia," February, 1908, p. 689; "Agricultural Credit Societies" (containing suggestions for their formation in England), September, 1908, p. 407.

members of the Society. The operations of the Societies are limited to small areas, usually a village or commune, so that the personal character and circumstances of applicants for loans may be known to the Committee. Perhaps the essential difference between the Schulze-Delitzsch and the Raiffeisen Societies rests on the fact that in the former definite security for a loan is required, in the latter the personal security of the borrower and two other members is accepted.

The total number of registered Credit Banks of all kinds in 1907 was 8,477, of which 1,958 were limited liability societies, and 6,519 were unlimited liability societies. There were in addition 66 unregistered societies. The extraordinary growth which has taken place in recent years may be judged from the fact that the number of societies has much more than doubled during the past ten years, the figures in 1897 showing 1,243 limited liability and 2,258 unlimited liability societies, or a total of 3,501. Full particulars as to the working of these banks are not available for a year later than 1902, when an exhaustive enquiry into the subject was made,* though figures relating to certain points for the year 1904 have recently been issued.† The relative importance of the different types of society may be judged from the following figures:—

	Number.		Number of Members.	
	1890.	1904.	1890.	1904.
Schulze-Delitzsch Societies, with limited liability	769	1,634*	312,661	821,807
Schulze-Delitzsch Societies, with unlimited liability	538	578	279,939	347,944
Raiffeisen Societies	182	4,577	9,670	504,589

* In 1902.

Raiffeisen banks were only introduced into the Austrian Empire in 1886, and the favour with which they have been received is clear from the rapid growth they have made since that date.

* Statistik der Registrierten Kreditgenossenschaften für 1902 (published in 1906).

† Österreichisches Statistisches Handbuch, 1907.

Owing to the limitation of the Raiffeisen banks to small areas the number of members to each Society is necessarily small, and averaged in 1904 about 110, whereas in the case of the other Societies it was from 500 to 600. In the same way the amount of the loans made is very much less, the outstanding loans in the Raiffeisen banks being £10,772,000 in 1904, compared with £36,454,000 in the case of the limited liability Schulze-Delitzsch banks, and £17,049,000 in the case of the unlimited liability type. When it is considered, however, that these Raiffeisen banks have been established, in the first instance, practically without capital, in thinly populated country districts, the amount and relative importance of the loans are sufficiently striking. The total amount outstanding when divided by the number of Societies is equal to about £2,200 each, or about £20 per member.

Interest on deposits in the Raiffeisen banks averaged about 4 per cent. in 1898-1902, but the average rate showed a tendency to rise; the interest paid in the other banks was about $4\frac{1}{2}$ per cent. The difference between the interest charged on loans and that paid on deposits is not great, and in the Raiffeisen banks it is kept very low, amounting usually to only 1 per cent., and sometimes less. This is due to the fact that the banks exist entirely for the benefit of the members, the administration being almost entirely honorary, only the Treasurer receiving a small gratuity. The average interest on loans in 1902 was 4·9 per cent. In the other Societies the interest on mortgages was probably a little over 5 per cent., and on bills about 6 per cent., but the available information on the subject is insufficient.

These various Credit Societies are affiliated in some 35 separate co-operative federations, which, however, are not exclusively federations of credit banks, but include also other co-operative societies. These federations in 1903 accounted for 5,471 Credit Societies, and they granted credit in the course of the year to the amount of £1,911,152, and their turn-over amounted to £19,186,972.

The encouragement given to the credit banks varies in the different States of which the Austrian Empire is composed, though the Central Government have also made a number of small grants, and have generally done a good deal to

stimulate the movement by advice and information. In Lower Austria the Central Agricultural Bank has been endowed by the Provincial Government with a sum of £8,300, and in addition in 1899 the Diet determined to devote the "Colloredo-Mansfeld Fund," which amounted in 1903 to £11,007, to the promotion of Raiffeisen banks and other Agricultural Co-operative Societies and their Federations. A small grant of £12 10s. is also made to Raiffeisen banks to defray the expenses of their formation, subject to their complying with regulations as to inspection and audit. The fact that their accounts are officially audited is stated to have greatly strengthened the confidence of the agricultural population in these institutions.

As regards Upper Austria the Provincial Government has since 1888, when Raiffeisen banks were first introduced into the Archduchy, granted cheap advances at 3 per cent interest to provide them with working capital. The amount in any one year was limited to £8,000, and as a matter of fact that sum has never been reached, the total amount so granted in 15 years only reaching £33,000. In addition a small loan of £8 is given free of interest towards foundation expenses. An annual grant of £200 has also been given to the Central Co-operative Bank at Linz.

An interesting form of assistance has taken the form of courses of instruction for book-keepers and accountants connected with the societies, towards which small grants for travelling expenses and payment of teachers have been made. The Diet also undertakes the supervision and auditing required by law, so that no expenses arise.

Most of the other Provincial Governments also make small grants and in other ways encourage both directly and indirectly the formation of Credit Banks, particularly those of the Raiffeisen type. A good deal of information on the subject was supplied by the local authorities of the various Austrian Provinces to the Sixth International Co-operative Congress, which was held at Budapest in 1904, and is printed in the Report of the Congress.

The weather during the *first* week of January was, on the whole, normal. In most of the western and northern districts rain was rather frequent, but in the east and south several fine intervals of considerable duration occurred. During the *second*

Notes on the Weather in January. week the weather was generally rough and unsettled. Bright sunshine, however, greatly exceeded the average over the eastern half of England. Rainfall was in general above the average. The *third* week was characterised by very much the same diversity of weather, but the temperature was generally below the average. Very little rain was experienced in the fourth week, and at many coast stations there was extremely little cloud. Fog and mist prevailed in some places, but sunshine was "abundant" in England, N.E., E., S.E., N.W., and S.W. Rainfall was "light" or "very light" everywhere.

Up to this point the season was a little backward. The accumulated day degrees above 42° for the four weeks were below the average, and those below 42° were on the whole above it. The rainfall, as well as the number of rainy days, was deficient. Sunshine was, however, above the average.

Reports from the Board's correspondents, however, are favourable. From Kent it is reported that labour has been little affected by the weather, outdoor work being hindered only for three days, while the frost was beneficial in its action on the soil. Ploughing is reported to be well forward, as are also the work of pruning and digging fruit gardens. Another correspondent reports that in Berkshire the wheat is looking very well everywhere, and so are winter oats and beans. Farm prospects generally are good. Green vegetables in the garden are, however, much cut up, and broccoli is practically destroyed.

Norway.—Mr. F. E. Drummond-Hay, H.M. Consul at Christiania, reports on the 7th January that the spring of 1908 was cold and wet, but in the subsequent months the weather was usually favourable,

Notes on Crop Prospects Abroad. and the hay crop was unusually large and of good quality. The total produce was 3,600,000, 18 per cent. above the average; wheat, rye, barley, oats, and potatoes all gave crops above the average, the quality of the potatoes, however, not being so good as usual.

Argentina.—According to a report in Beerbohm's Corn Trade List, January 8th, the wheat crop is now officially estimated at 21,300,000 qrs., a reduction of about 10 per cent. from last year's abnormal yield.

Canada.—The Crop Bulletin issued by the Census and Statistics Office of the Canadian Government for December states that the total yield of wheat in 1908 was 112,400,000 bushels, or 17 bushels per acre; of oats 250,400,000 bushels; and of barley 46,800,000 bushels.

In Ontario dry weather in the autumn has hindered ploughing, and the acreage under winter wheat will be less; the condition of the crop at present is also poor. In the Provinces of Manitoba and Saskatchewan, which produce three-quarters of the Canadian wheat yield, fine weather has facilitated the completion of a large area of autumn ploughing. Only spring wheat is grown there.

The World's Hop Acreage.—Attention has recently been directed to the world's production of hops, and a considerable amount of statistical information on the subject was prepared by the Board of Agriculture and Fisheries for the Select Committee on the Hop Industry, and is published with their Report (213 of 1908). In continuation of this information the following particulars as to the hop area of the world appears in Part iv. of the Board's Agricultural Statistics for 1907 [Cd. 4445].

The number of countries in which hops are cultivated is small, but unfortunately the returns are somewhat incomplete. The following is a com-

parison of the average acreage under hops in each country in the latest year for which returns are available and at about twenty years earlier. The figures, where possible, are based on the average of the three years 1885-7 and 1905-7 respectively. In the case of Hungary, Belgium, France, and Ontario, the average of 1904-6 is taken in the absence of returns for 1907. For Hungary, Belgium, United States, and Canada no figures are available for an average of the earlier period, and those for the single year which is nearest to the date have been taken for this purpose:—

		1885-7.	1905-7.
		Acres.	Acres.
England	...	68,387	46,876
Austria	...	34,531	56,650
Hungary	...	941	1,952
Belgium	...	10,337	6,025
France	...	8,583	7,380
Germany	...	116,678	96,058
Netherlands	..	503	136
U.S.A.	...	46,800	55,613
Canada—Ontario	...	1,340	1,994
Other Provinces	...	574	503
Victoria	...	770	296
Tasmania	...	596	837
New Zealand	...	587	961

Russia is the only important hop-growing country for which no official returns are available. Commercial estimates of its crop are made, which vary greatly from year to year, but they do not necessarily indicate any material change in the acreage of the crop. Taking the figures for the countries above tabulated, it will be seen that there have apparently been reductions in the total area under hops in every country except Austria-Hungary, the United States, Canada, Tasmania, and New Zealand.

The greatest relative reduction of area appears to have occurred in Holland, where the acreage under hops has fallen by no less than 73 per cent., and in Victoria, where the decline has been 60 per cent. In Belgium the decline amounts to 40 per cent., in England 30 per cent., and in Germany 18 per cent. It may be added that in England and in Germany the acreage declined during the three years 1905-7, and the decline continued very markedly in 1908. In Victoria and Belgium there is no special indication of continued reduction during the later years.

The greatest relative increases of hop area have occurred in Hungary, 107 per cent.; New Zealand and Austria, 64 per cent.; Ontario, 49 per cent.; Tasmania, 40 per cent.; and the United States, 19 per cent. As regards the United States, however, it must be noted that, as official acreage returns are only published for census years, the figures given for that country in the above table relate to 1879 and 1899 respectively. There seems little doubt that since the latter date there has been a substantial increase in the hop acreage of the Pacific States, and although there has probably been some reduction of acreage in the State of New York, it may be fairly assumed that on balance there has been an extension of the American hop area since 1899.

If, however, we may rely on the indications furnished by these not very satisfactory figures, it would appear that there has probably been during the past twenty years a net reduction in the hop area of the world amounting to something between 10,000 and 20,000 acres. On the other hand, the returns of production, so far as available, show no falling off, but rather an increase in the total supply of hops on an average of years.

The Board of Agriculture and Fisheries have been furnished by the Board of Trade with the following report,

**Agricultural Labour
in England
during January.**

based on about 210 returns from correspondents in various districts, on the demand for agricultural labour in January :—

Agricultural employment was fairly regular, on the whole, during January. Many day labourers, however, were in irregular work on account of an insufficient demand, which, in a number of districts, was less than usual through the forward state of farm work.

Northern Counties.—In *Northumberland*, *Cumberland*, and *Westmorland* severe weather interrupted outdoor employment at the beginning of the month, and day labourers lost time in consequence; there was a surplus of this class of labour in the two latter counties. Employment was generally regular in *Lancashire*, with the supply of labour about equal to the demand. Threshing, hedging, carting manure, &c., provided fairly good outdoor employment in *Yorkshire*, but day labourers were in excess of the demand.

Midland Counties.—Employment was fairly regular in *Cheshire*, but there was only a moderate demand for day labourers. Similar reports come from *Derbyshire* and *Nottinghamshire*. Threshing, carting manure, cutting hedges, &c., afforded a good deal of work for day labourers in *Leicestershire*, where employment was generally regular. Many extra labourers were reported as in irregular work in *Staffordshire*, on account of the supply being greater than requirements. There was only a moderate demand for day labourers in *Shropshire*, and some were said to be in irregular work. Employment was fairly regular in *Worcestershire* and *Warwickshire*, where threshing, hedging and ditching, and carting manure offered a fair amount of outdoor work. The supply of and demand for labour were generally about equal in *Northamptonshire* and *Oxfordshire*. In *Buckinghamshire* day labourers were reported as in excess of the demand, and there was a consequent irregularity of employment. A correspondent in the *Wycombe* Union mentions a difficulty in finding skilled men for permanent situations. Some irregularity of employment was reported from *Hertfordshire*, though carting manure, threshing, &c., provided a fair amount of work for day labourers. There was generally regular employment in *Bedfordshire*; a correspondent in the North Bedford Union mentions a gradually improving supply of men for permanent situations.

Eastern Counties.—Employment was generally regular in *Huntingdonshire* and *Cambridgeshire*, but day labourers were in somewhat irregular work in many districts, on account of an insufficient demand, due partly to frosty weather and partly to the forward state of farm work. Threshing, manure-carting, hedging, ditching, root-lifting, and potato-sorting provided fairly full employment for extra labourers in *Lincolnshire*, where the supply of and demand for labour were reported about equal. Day labourers in *Norfolk* and *Suffolk* lost time at the end of the month owing to the severe weather, and in several districts an over-sufficient supply of men of this class was reported owing to the forward condition of threshing. Frosty weather interrupted outdoor work at the beginning and end of the month in *Essex*, where there was otherwise generally sufficient work for day labourers.

Southern and South-Western Counties.—Agricultural employment in *Kent* suffered but little interruption from the weather, but although threshing and other work caused a moderate demand for extra labourers, many were in irregular work. There was a plentiful supply of extra labourers in *Surrey*, and in the *Guildford* Union more men were said to be in irregular work than in December. A number of day labourers were reported as in irregular employ-

ment in *Sussex* on account of an excessive supply, but regular work was found for many men, principally at threshing and wood-cutting. There was generally some surplus of day labourers in *Hampshire* and *Berkshire*, and certain correspondents refer to the number in irregular employment as being rather greater than usual for the time of the year. There was a moderate demand for day labourers in *Wiltshire* on account of threshing, hedging, ditching, manure-carting, &c., but a number of day labourers were unable to get regular work, while unfavourable weather somewhat interfered with the employment of this class of labour. Work was reported as well forward in *Dorset*, and there was consequently not much demand for extra labourers. Frost somewhat hindered farming operations in *Somerset*, but not many men were reported in irregular work throughout the month. In *Herefordshire*, except for a few days when severe weather interrupted work, the supply of and demand for day labourers were generally about equal; some scarcity of men for permanent situations, however, was reported. Several day labourers were in irregular employment in certain districts of *Gloucestershire* owing to an insufficient demand for their services. A scarcity of men for milking is reported from the Chipping Sodbury and Dursley Unions. Work on the land was interfered with in some districts of *Devonshire* by frost and snow at the end of January, and some day labourers lost time in consequence. Regularity of employment is reported from *Cornwall*, the supply of day labourers being about equal to the demand.

MISCELLANEOUS NOTES.

Unthriftness in Geese.—Mr. Edward Brown, Lecturer in Aviculture at University College, Reading, has supplied the Board with the following notes on the subject of geese "going light":—

"Going light" may be due to general debility or unfavourable conditions. In a very dry summer geese on the higher lands, where there is very little in the way of herbage, often suffer from this cause, and it would appear to be a lung trouble aggravated by an excessively dry situation. It must be remembered that geese are by nature grass eaters, and where they are unable to obtain a sufficient supply they are subject to affections of this kind. The treatment necessary is to remove them on to lower-lying lands where the grass is more abundant. This is a question which breeders of geese must constantly bear in mind, but the trouble is more especially found in dry seasons.

Importation of Bulbs into Bermuda.—According to Amended Regulations made by the Board of Agriculture of Bermuda, and dated 12th Jan., 1901, Lily, Hyacinth, and Narcissus bulbs imported into Bermuda will not be delivered without the authority of the Superintendent of the Botanic Station, who will take and retain control of consignments for not less than four days for such inspection and treatment as may appear to him to be expedient. Consignees of imported bulbs are to notify the Superintendent as early as practicable. The owner or consignee of any bulbs which have been treated is required to pay the expenses incurred. All bulbs which, in the opinion of the Superintendent, are diseased, and which he thinks might be injurious to the Lily industry, are to be destroyed.

Manufacture of Peat Fuel.—Many processes have been invented for the manufacture of peat by machinery, and a number of systems are now in use on the Continent. Usually the peat is dug out mechanically and passed through what may be called large mincing machines. As the pulp is forced out through a mouthpiece, it is cut off in blocks and afterwards dried. About two tons of this improved peat is equal to one ton of coal.

Attempts have been made to manufacture briquettes from peat alone of equal calorific power with that of coal. Little success seems to have at-

tended these efforts, and there does not appear to be any successful process at present at work.

Peat charcoal is made on the Continent by charring in heaps in the same way as wood charcoal, the product being used for metallurgical purposes. Large works have recently been erected at Benerberg, Bavaria, for the production of charcoal, and other substances, from peat, but it remains to be seen whether the process will be a commercial success.

Prevention of Bee-diseases in Cape Colony.—A Proclamation by the Governor of the Cape Colony was issued on the 8th September, 1908, whereby the importation of bees and their larvæ or eggs is prohibited, with the exception of introductions made by or on behalf of the Government of the Colony. In connection with "foul-brood" disease, the importation of honey and bees-wax (including foundation comb) is also prohibited except under a written permit obtained from the Secretary for Agriculture, under such restrictions and safeguards as may seem expedient and necessary.

Application of Acetylene Residue to Land.—The residue left after acetylene gas has been made from calcium carbide consists theoretically of calcium hydrate, i.e., slaked lime, and should therefore be suitable for application to gardens. Commercial calcium carbide is, however, apt to contain small quantities of calcium phosphide, and possibly of calcium sulphide, which might affect the value of the residue for horticultural purposes, though it is probable that the risk of injury would be slight. This is borne out by the experience of two correspondents, both of whom are well qualified to judge. In one case this residue has been used for ten years, being mixed with ordinary soil, and the mixture then spread on the surface and afterwards dug in. Another correspondent considers it of the greatest value on clay soils, the only caution necessary being to allow it to weather sufficiently to destroy its caustic powers before it is put on soil where there are growing crops or where planting is to take place at once. It is also stated to be most valuable for running direct into cesspools, as it takes out most of the solid matter, leaving a practically clear effluent, whilst the sludge at the bottom of the cesspool, when dug out at the end of the year, is an excellent manure.

OFFICIAL CIRCULARS AND NOTICES.

The Board of Agriculture and Fisheries in pursuance of the provisions of the Small Holdings and Allotments Act, 1908, have made a Regulation entitled

Compulsory Purchase Regulations under the Small Holdings Acts. the "Small Holdings and Allotments (Compulsory Purchase) Regulation, 1908 (No. 2)," dated 7th December, 1908.

This Regulation provides that for the purpose of an Order for compulsory purchase made or confirmed on or after the 1st January, 1909, the appendix to this Regulation is to be substituted for the appendix to the Small Holdings and Allotments (Compulsory Purchase) Regulations, 1908.

Copies of this Regulation containing the appendix can be obtained from Messrs. Wyman and Sons, Fetter Lane, E.C., price 1d. each.

The Public Health (Foreign Meat) Regulations, 1908, which were summarised in this *Journal*, December, 1908, p. 712, provide for the acceptance of certain "official certificates" as evidence that the **Public Health (Foreign Meat) Regulations.** pig from which the meat is derived has been certified by a competent authority in the place of origin to be free from disease at the time of slaughter, and that the meat has been certified by the like authority to have been dressed or prepared and packed with the needful observance of all requirements for the prevention of danger arising to public health from the meat as an article of food.

The Local Government Board have now published a notice containing a schedule of the labels and marks admissible as "official certificates" in respect of pork, &c., from Denmark, Holland, Canada, and New Zealand, and copies may be obtained from Messrs. Wyman and Sons, Fetter Lane, E.C.

This Order, which came into force on 20th January, 1909, applies to the **American Gooseberry Mildew (Norwich)** city of Norwich only. The Order is on similar lines to those applied to other districts where American Gooseberry Mildew has appeared. A summary of the provisions of former Orders was given in the *Journal*, January, 1908, p. 624.

Attention is drawn to the fact that a new edition of the Board's Leaflets (Nos. 1-100), bound in stiff boards, is now ready. Price 6d., post free.

Leaflets of the Board of Agriculture.

This edition has been extensively revised, and includes an exhaustive index to the different subjects dealt with in the leaflets, as well as a special index to the insecticides and fungicides recommended.

Leaflets Nos. 101-200, bound up in a similar way, will be issued very shortly.

The leaflets up to No. 200 can also be obtained grouped in separate sections according to subject. These are issued in paper covers, price 1d. each, post free.

The classification adopted is as follows:—

Section 1.—Acts of Parliament and Miscellaneous Subjects.

Section 2.—Farm Animals and Dairying.

Section 3.—Diseases and Insect Pests of Farm Animals.

Section 4.—Poultry and Bees, their Breeding and Management.

Section 5.—Cultivation of Fruit Trees and Farm and Garden Crops.

Section 6.—Manures and Feeding Stuffs.

Section 7.—Forest Trees and their Diseases.

Section 8.—Wild Animals and Birds.

Section 9.—Insects and other Pests injurious to Farm and Garden Crops.

Section 10.—Insects and other Pests injurious to Fruit Trees and Bushes.

Section 11.—Fungi injurious to Farm and Garden Crops.

Section 12.—Fungi injurious to Fruit and Fruit Trees.

Any of the volumes mentioned above can be obtained on application to the Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W. In remitting money, amounts of sixpence and upwards should be sent in the form of postal orders or cheques.

SUMMARY OF AGRICULTURAL EXPERIMENTS.*

EXPERIMENTS WITH LIVE STOCK.

Feeding of Cattle (Univ. Coll. of Wales, Report on Expts., 1906).—The usual practice in Wales is to feed store cattle in winter on hay, straw, and roots, with occasionally a small amount of concentrated food. The object of this experiment was to determine to what extent it is profitable to feed store cattle on purchased foodstuffs, and to compare a few of the more commonly used foods. Nine store cattle, rising one year old, bred on the College farm, were divided into three lots and received a daily ration of 20 lb. of roots, hay and straw as required, and 3 lb. of a concentrated feeding stuff, which differed in the case of each lot. The experiment lasted 100 days, or just over fourteen weeks. The lot receiving linseed cake made a total gain of 2 cwt. 21 lb., at a cost of 3 $\frac{3}{4}$ d. per lb. of increase; the lot which were fed on a proprietary feeding cake gained 2 cwt. at a cost of 3 $\frac{1}{2}$ d. per lb.; and those fed on maize meal increased by 1 cwt. 1 qr. 14 lb., which represented a cost of 4 $\frac{9}{10}$ d. per lb. gained. During the summer the animals were turned out to grass, with no artificial feeding stuff, when those that had received linseed cake again did best, but those that had received the feeding cake made a rather smaller increase than the maize meal lot. The conclusion from these trials, therefore, is that linseed cake is the foodstuff which gives the best result.

Feeding of Cattle (Univ. Coll. of North Wales, Bangor, Agric. Dept., Bull. IX., 1907).—This experiment was intended to compare decorticated cotton cake with a mixture of undecorticated cotton and linseed cakes. Two lots of five bullocks were fed for about nine weeks with 84 lb. swedes, 10 lb. hay, 6 lb. straw, and 4 lb. crushed oats. Lot I. received in addition 2 lb. undecorticated cotton cake and 2 lb. linseed cake, while Lot II. got 4 lb. decorticated cake. After six weeks Lot I. received $\frac{1}{2}$ lb. more of each cake, and Lot II. received 1 lb. extra of the cake, while the supply of crushed oats was increased to 5 lb. in each case. The animals in Lot I. which were fed on mixed cotton and linseed cake gained in live weight over a stone per head more than those fed on decorticated cotton cake alone. The mixed cake cost 17s. 8d. per head, while the decorticated cake cost 20s. 5d. The result, therefore, was decidedly in favour of the mixed cake, but it was in a measure due to the poor return made by one bullock in Lot II.

Feeding Cattle with Mangolds (Cambridge Univ., Dept. of Agric., Guide to Expts., 1907).—In connection with an investigation into the composition of root crops, feeding trials were carried out with various strains of mangolds. These experiments are referred to under Experiments with Root Crops, *Journal*, Oct., 1908, p. 538.

* A short review or summary of the experiments carried out in this country, classified according to subject, is given monthly. (The first appeared in the issue for September, 1908.) This summary is not intended to do more than give a brief indication of the character of the experiment and of the conclusions reached. Those who are interested in any particular investigation can refer for further details to the original publication. The Board would be glad to receive for inclusion in this summary copies of reports on inquiries, whether carried out by agricultural colleges, societies, or private persons.

Breeding of Sheep (Cambridge Univ., Dept. of Agric., Guide to Expts., 1907).—The object of these preliminary experiments was to follow out the inheritance of certain characters in sheep. The characters selected were horns and face colour, since obvious characters, such as these, are very much easier to follow than those of wool, carcase, or early maturity. It appears that horns and face colour in sheep (Dorsets and Suffolks were used) are inherited in accordance with Mendel's principles, horns being dominant in males, recessive in females. In face colour no dominance is shown, the two colours being mixed in the hybrids, which, when bred together, give pure whites, pure blacks, and hybrids again. The types produced are illustrated. These investigations are being continued.

Breeding of Sheep (Univ. Coll. of North Wales, Agric. Dept., Bull. I. and II., 1906, and X., 1907).—Bull. I. refers to a breeding experiment with Suffolk sheep, which, though introduced some years ago, are not found in Wales in any great numbers. Professor Winter, however, considers that they are among the best mutton sheep, and observes that on the good land in the lowland districts of Wales they would do well, though, under the system of farming adopted, they cannot compete with native breeds on ordinary land in the low country. In 1906 two lots of twelve Suffolk ewes each were bred with a Southdown and Border-Leicester ram respectively for the production of fat lambs. The Border-Leicester ram was an uncertain stock-getter, and the lambs were later than the others, which made the conditions somewhat unequal. The Southdown-Suffolk cross lambs were considered superior on the whole, though the others were big and well fleshed; and Prof. Winter states that for those who still keep big sheep, and who change their ewes annually, Suffolk ewes may prove a good investment provided the land is sufficiently good. There is less difficulty in disposing of Suffolk ewes when fat than is experienced with many other breeds, as the Suffolk have so much lean flesh.

The two other bulletins referred to contain reports of a series of experiments which has been carried on from 1900 to 1907 in the breeding of cross-bred lambs from Welsh Mountain ewes. Rams of eight different breeds have been tried at different times, but the only rams that have been regularly used through the experiments are the Wiltshire and the Southdown. In 1906 and 1907 Dorset Horned and Welsh rams were used in addition. The Dorset Horned cross during these two years gave good results. The pure Welsh lambs get fat even on poor land, but they scarcely produce sufficient weight to induce those who farm good land to breed them in preference to cross-breds.

Professor Winter observes that both the Wiltshire and the Southdown make very satisfactory crosses with the Welsh; the Wiltshire crosses have the appearance of being bigger than the Southdown, but in these experiments the latter were in most years heavier when weighed. The Southdowns are short-legged, almost invariably have good backs and loins, and are not easily excelled for general quality. The experience at the College farm has been that the Southdown cross is less affected by seasons, and is more likely to get fat on any class of land than the Wiltshire. Tables are given showing the dates of sale and weights of the lambs for the years 1900-7.

In 1905-6 three lots of two-year-old cross-bred mountain ewes were

mated with Wiltshire, Southdown, and Border-Leicester rams. There was not much to choose between the Wiltshire and the Southdown lambs. The Wiltshires were, however, decidedly heavier, although they had not the same quality, nor did they fatten so early as the Southdowns. The Border-Leicester lambs were later, and consequently not altogether comparable.

Breeding of Sheep (Cumberland and Westmorland Farm School, Ann. Rept., 1906-7).—The ewes mostly in favour in Cumberland and Westmorland for the production of fat and store lambs are Cheviot-Border-Leicester ("half-bred"), Scots Black-Face—Border-Leicester ("grey face"), and Scots Black-Face-Wensleydale ("Wensleydale grey face"). Seven of each were mated with a Border-Leicester ram, and seven with a Wensleydale ram. The results showed that wherever Wensleydale blood appeared, the lambs were slower in fattening, though they grew rapidly; consequently they had to be kept longer, attained much greater weights, and sold at a lower price per pound (because later) than the lambs otherwise bred. This feature was more pronounced where a double share of Wensleydale blood appeared. On the other hand, lambs got by the Border-Leicester ram were always fat when big enough for market. The inference drawn from the result is that the Border-Leicester ram is better for fat lambs. The Wensleydale ram, on the other hand, is the better for good growing store lambs containing much lean flesh. The lambs from the grey-faced ewes by the Border-Leicester tup reached 70 lb. and sold at 6d. per lb. at an average of 10½ weeks.

Breeding of Sheep (Univ. Coll. of Wales, Rept. on Expts., 1906).—Various breeds of sheep were kept on the College farm, and trials were made both in 1905 and 1906 with a view to ascertaining the best pure breeds and crosses. The question of the most suitable crosses will be the subject of further experiments, but as regards pure breeds, the conclusion reached was that pure-bred Kerries were by far the most profitable sheep to keep on the College farm, while Shropshires were the least profitable of all. An improved lot of pure-bred Welsh Mountain sheep was found to live cheaply, require very little attention during the winter or at lambing time, and to produce lambs that matured early and sold well. For crossing purposes the Radnor sheep, when tried, proved unsuitable, but when kept pure they appeared to be a profitable breed of sheep, which thrived well and gave very little trouble.

Feeding of Sheep (Cumberland and Westmorland Farm School, Ann. Rept., 1906-7).—The object of this experiment was to ascertain whether, in view of the high price of cakes, oats could profitably be substituted for linseed cake in fattening sheep. Two lots of seventeen half-bred hoggs (Cheviot-Border-Leicester) were fed for seventy-two days, the daily ration being 1 stone cut swedes, hay as required, and in one case ½ lb. oats, and in the other ¼ lb. oats and ¼ lb. linseed cake. The gain in live weight of the lot receiving oats alone was 370 lb., and of the lot receiving oats and linseed cake 450 lb. Valuing the mutton at 4d. per lb., and deducting the extra cost of cake, the lot fed on cake and corn showed a gain of 22s. 2d. over the lot receiving oats only.

Feeding of Lambs (Univ. Coll. of North Wales, Agric. Dept., Bull. VIII., 1906).—A series of experiments with various "sugar foods".

has been carried out at this College during three years. In 1906 Molascuit was tested. For the purpose of the test with Molascuit, two lots of fifteen mountain lambs were given a ration of 9 lb. sliced swedes, $\frac{1}{2}$ lb. long hay, $\frac{1}{2}$ lb. bran, and either $\frac{1}{2}$ lb. crushed oats or $\frac{1}{2}$ lb. Molascuit. The sheep would not eat more than $\frac{1}{2}$ lb. of the Molascuit per day, and the bran was added because they did not care for it alone. From December 8th to February 17th the lambs receiving crushed oats gained, on the average, $8\frac{1}{2}$ lb., while the others gained $7\frac{1}{2}$ lb. After deducting the extra cost of the oats, the average net gain in favour of oats was 1s. 9½d. Professor Winter observes that, after taking into account the difference in money value, four sugar foods which have been tested have all proved to be inferior to oats of average quality, but that, so far as can be judged, they are good and wholesome foods, and, provided properties are not claimed for them which they do not possess, there is no reason why they should not be freely used in stock-feeding if sold at reasonable prices. But he adds that, considered as foods, it must be obvious that the prices of some of them are ridiculously high.

Preservation of Eggs in Water-glass (Aberdeen and North of Scotland Coll. of Agric., Bull. VIII., 1907).—Eggs a few days old were kept in water-glass for periods varying from six months to four years. At six months there was no appreciable change, and after one to four years the eggs had only a slight peculiar taste suggestive of soda, none being bad. Analyses of the eggs are given. A summary of these experiments appeared in the *Journal*, February, 1907, p. 688.

Dry-Mash Feeding of Chickens; Housing and Feeding of Poultry (Univ. Coll., Reading).—These experiments were designed to try the system of dry-mash or hopper feeding, and the "colony" system of housing, by which a large number of fowls are kept on a given area; methods that are largely adopted in America. Tables are given of the cost of food, egg production, and weights realised. These reports appeared in this *Journal*, January, 1908, and May, 1908.

THE CORN MARKETS IN JANUARY.

C. KAINS-JACKSON.

The corn markets for the first five weeks of the year are apt to be disappointing, though it seems to be a justifiable expectation that the market should advance with the new year, and before Lady Day there is in most years an actual forward movement, sometimes with very heavy sales. But the exchanges are "slow starters," and now that the new crops of Argentina and Australia play such an important part in the trade of this country, there is an increased disposition to wait until the cable brings the news of the first important shipments. The markets from the 1st to the 23rd were not active for any sort of flour, and this acted as a drag on the wheat trade, but maize, feeding barley, linseed, and beans were in improved request from December, and in cotton seed a brisk business was done at enhanced quotations. The pace was not fast as a whole, but the markets were far from inert. From the 25th to the 30th inclusive a large business was done

in wheat cargoes, while all British produce met with increased appreciation at previous best prices.

Wheat.—The price of English wheat since harvest, which at the end of January represented twenty-two completed weeks, was 31s. 10d. per qr., but the prices of January itself were higher than this, and London recorded more than one really good average—over 34s. per qr. The average, as it has to be given officially, is always dragged down by the sales at small markets, which are usually places to which the finer qualities are not sent, and by the sales of chicken wheat at the larger centres. But it must not be forgotten that these two classes of what merchants call “cheap sales” represent a true if not wholly fortunate feature of the crop, which has its less satisfactory samples as well as its finer milling qualities. What is prejudicial to the averages quotable, but is clearly beyond the power of the executive to control, is the private passage direct to the mill of good wheat, which the miller instantly appreciates. It may almost be said that the better the sample the less it has to seek a market. The sales of British wheat at Mark Lane have been sustained and excellent; practically nothing sent up has gone a week unsold. The demand for foreign wheat has been far less regular. Russian has been scarce, and little has been offered under 40s. per 496 lb. The total shipments from Russia for 1908 are given unofficially at 6,750,000 qrs. of 480 lb., against 11,000,000 qrs. for 1907. There is, consequently, a general dearth of Russian wheat in Western Europe just now. Indian wheat is still more scarce, the total shipments of 1908 not being quite 600,000 qrs. American and Canadian sorts are in fair offer, the sorts rich in dry gluten being held for 40s. per 480 lb. Durum is in steady request at 38s. per 480 lb. It is called macaroni wheat by those opposed to its use, but its vogue is undoubted, and it is said to enable English millers to simulate or rival special American makes of flour, for which, before Durum was obtainable, they appeared to lack the recipe. This must, of course, be regarded merely as one of the attempts made to explain the growth of a new demand. Durum has only entered the London quotation lists within the last three years. Argentina was a little slow in starting new crop shipments, but managed to send off over half a million qrs. between the 18th and the 30th. These supplies are now on passage, and are offered at 36s. to 36s. 6d. per 480 lb. to buyers of whole cargoes. Australia has surprised the trade by the energy of her wheat shipments, Victoria especially being credited with a fine yield. The price asked is about 37s. per 480 lb. Indian new crop wheat offered at Christmas for 37s. per 492 lb. May shipment, with an improved crop prospect, is in increased evidence, and at the end of January there were fair sales for June shipment at 37s. white, 36s. 6d. red, paid. The reserves of wheat in importers' hands fell to 1,630,000 qrs. before the end of the month, a total in marked contrast to the 2,465,000 qrs. held on 1st February, 1908. The American visible supply, however, was 9,705,000 qrs., against 8,283,000 qrs. a year previously. New York showed exceptional stability, winter wheat opening the month at 38s., and closing at 38s. 3d. per qr.; spring wheat opening at 41s. 6d., falling to 41s. 3d., but returning to 41s. 6d. on the 30th of the month.

Flour.—The price of best London flour remains absolutely immobile at 33s. per sk., and Hungarian has not come down in price, though

an expectation that it would do so was fairly general. The London millers are prepared to make flour by the Hungarian method and to sell it at 34s. per sk. The ordinary Household grade of flour is a trifle lower than a month ago—28s. to large cash buyers. The competition of flour up from the country rather than from America is the cause of this slight, but none the less significant, depression. Country millers have to spend perhaps an average of 1s. per sk. on getting their flour up to London, but they pay very much lower rates and taxes than the London millers. A good trade has been done in Kansas flour, but Minneapolis and Duluth are not quite the names to conjure with that they were ten years ago. The Canadian mills have gained in prestige, and send fine flour rich in gluten at 31s. per sk. It is difficult to say what quantity of American flour London can now take weekly without depression; 50,000 sacks seems to depress the average market. Glasgow, Dublin, and Belfast are good buyers of American flour, both of fine quality and of the "first bakers" or middle-class grade.

Barley.—The average price of English barley continues to be maintained at a slightly higher level than that prevailing a year ago. Kent and Berkshire have given some noticeably good averages, and prices are not unsatisfactory in Surrey and Sussex. The sales have been rather smaller than usual, but it cannot fairly be said that business has been dull. Foreign barley at 21s. to 22s. for the light 400 lb. kinds has moved off steadily; the demand for barley meal is constant, though its exact disposition is not easily ascertainable. The imports of the United Kingdom for the first five months of the cereal year were larger than in the like period of last season, but the supply included a material proportion of 448 lb. barley, an entirely separate trade from the feeding kind. The Californian brewing barley is coming in very handy, and is serviceable grain of a very fair value to the brewer. Anatolian barley is not to hand in usual quantity, and is missed. There were 763,000 qrs. of barley shipped from Russia in January, against 87,000 qrs. from Roumania, 81,000 qrs. from North America and about 50,000 qrs. from all other countries.

Oats.—Farmers are very disappointed with market prices of oats, which at scarcely any exchanges realise more than a sovereign for good 336 lb. sorts. The average on the sales of twenty-two completed weeks since harvest was only 17s. 3d. per qr., a fall of 1s. on the year, and a price which may be said to urge the grower to make the most he can of the produce on the farm. Possibly his live stock will benefit, and the low market price prove a blessing in disguise, for when the average is over 20s. per qr. there is a distinct tendency to sell the oats off the farm and to buy other staples, especially maize, in their place. Maize is seldom dearer than, say, 5s. 10d. per cental, whereas 20s. per qr. (312 lb.) for oats about equals 6s. 5d. per cental. The cheap light 304 lb. oats on offer from Argentina, Russia, Roumania, and European Turkey are priced at from 15s. to 16s. per qr. Argentina in January shipped 271,000 qrs., Russia 391,000 qrs. Other shippers were completely outclassed, and the United States did not ship at all. The quantity of oats on passage is heavy, but they are almost exclusively of the 304 lb. sorts, which do not compete with English.

Maize.—The fall in prices in the maize trade during January was

not as great as was expected. It is the peculiarity of the maize crop to be unshippable for two months after the cob is severed from the stalk, and thus there is a long interval between a surplus being secured and its being exported. The United States were probably expected by many to ship as freely as in January, 1905, when 2,423,000 qrs. were sent off, but the actual exports were only 870,000 qrs. Maize has not yet gone below 26s. per 480 lb., and the better kinds make 28s. per qr. There is a very useful supply of small round corn which has many feeding excellencies. The imports of maize since the beginning of the cereal year have been a good deal below the average, and the stocks in granary on the last day of January are very small. The chief expectation of cheap maize appears now to reside in the Argentine offers to ship a crop still two months from harvest, and requiring another two months to mature. The price asked is 23s. 6d. per 480 lb. for shipment before 30 June. This maize could not influence our spot markets before August.

Pulse.—A good sale of beans has marked the month. English have made up to 37s. per 532 lb., but more ordinary transactions have been at about 33s. per 504 lb. The buyer now very often prefers to buy beans already split, and pays about 11s. per 160 lb. bag for them in that form. Foreign beans are not appreciably underselling the home product. Peas are in fair request at 48s. per 504 lb. for fine English white, 80s. for best blue. The foreign sorts are lower both in price and quality. Split lentils at 13s. per cental, and hand-picked haricots from Rangoon at 38s. per 504 lb. are articles in some request.

Oil Seeds.—The demand for oil seeds keeps at a high level, and cotton seed, despite 64,000 tons on passage, has advanced from seven guineas per ton on the first day of January to eight pounds on the last. This is for fine Egyptian. The inferior produce of India and Brazil is obtainable for about £6 10s. per ton. Linseed makes 47s. per qr., or thereabouts, for Indian and Argentine, but the latter with large new crop shipments is expected to be obtainable at a decidedly lower price before long. The price of rapeseed is steady at £3 per 416 lb. for English, and that of poppyseed at 50s. per 377 lb. for Indian.

Farm Seeds.—There is a good trade doing in English red clover seed; the supply is also good, so that prices are decidedly more moderate than a year ago; 68s. per cwt. is hardly exceeded, whereas five guineas was paid at this date in 1908. High prices rule for the fescues and for lucerne, but trefoil and trifolium are at a moderate level. Good white mustard seed makes 11s. per bushel, and brown is at nearly the same price. Canary seed is in increased request, and prices are a little higher than a month ago for all the chief sorts.

Minor Staples.—A good business is being done in miscellaneous staples, including feeding rice (7s. 3d. per cwt. Rangoon cargoes), beet sugar (10s. 2d. per cwt. German), dried ale grains (about 6s. per cwt.), and in the "condimental" foods, such as locust beans (about five guineas per ton) and carraways (at two guineas per cwt.). Much wholesome food which live stock reject for want of flavour may be made appetising by judicious mixtures of safe condiments, some of which are genuine foods as well as appetisers.

THE LIVE AND DEAD MEAT TRADE IN JANUARY.

A. T. MATTHEWS.

Fat Cattle.—The new year opened with very moderate supplies of fat cattle, and a healthy demand for all of fairly good quality, few complaints being now heard of want of condition. At Islington, however, the number (1,230) present was considerably above the average, business was brisk, and the market on the 4th was cleared by an early hour at fully the prices of the last December market. Shorthorns are now once again the most numerously represented breed, it being only during the grass time that the Herefords and Welsh Runts are seen in large numbers at the London market. The few of these which appear after Christmas are generally poorly finished, and so compare badly with the thoroughly well-fed Shorthorns from the Norfolk stalls and yards. This is mentioned to explain why, at this period, the quotations for the former breeds are relatively low. On this first market of the year, Shorthorns realised up to 7½d. per lb., against 7d. for Herefords, 6½d. for Welsh, and 7¼d. for Scots and Devons. The average price of 63 animals of various breeds, weighed after sale, was 37s. per live cwt. Trade on the following Monday, 11th January, was much weaker, and prices receded 4d. per lb., partly owing to a much larger supply, but more to the absence of buyers for the dead meat market. These, however, reappeared on the 18th, and, with 400 less on offer, there was a sharp recovery, and all the cattle were soon sold at the extreme rates of the previous week, and in some cases more money.

The trade in the large provincial centres was very firm during the first week, but, like that of London, was followed in the second by a period of reaction and some weakening of values. Still, the undertone was good, and small concessions led to ready transactions. The following week was marked by good supplies in most places and a brisk trade almost everywhere, except in Scotland. In London, Scots and Devons made up to 7½d. per lb., and Shorthorns nearly or quite as much. These last were quoted at 8s. 5d. per 14-lb. stone at Islington, 8s. 6d. at Ipswich, Norwich, and Nottingham, and 8s. 9d. at Basingstoke, while 7s. 10d. was the highest at Bristol, Leeds, and Salford. On the other hand, more than half the Scotch markets recorded a decline. The last London market of the month was supplied with 1,070 head of cattle of good and even quality. The trade at this market is greatly influenced by the attendance of buyers for the dead meat trade. When their requirements are such as to induce them to be present, trade is always greatly stimulated, but this only happens occasionally. They were there in force on the 25th, and, needless to say, under these circumstances, all the best animals were quickly sold at the extreme rates of the previous week, though there was no actual advance, at least in nominal quotations. The whole month was characterised by a firm and steady trade for cattle, the moderate supplies being readily absorbed at very fair prices.

Fat Sheep.—The first week in January has been always considered a good time for marketing sheep, as the consuming public are then supposed to have been satiated with Christmas beef. It has, indeed,

generally been so in the past, but this year proved a remarkable exception, for the year opened with a poorer demand and lower prices than ever. At Islington, on the 4th, there were 5,090 sheep, which was quite a moderate number, chiefly composed of good sorted animals of medium weights. The top price of 8d. per lb. was only realised by a few pens of very small tegs, and the price of those weighing 72 lb, and over declined a farthing per lb. from the last day of the old year, choice Downs selling at 8d. and ewes at 5d. per lb. The same prices were current on the 11th, but on the 18th, with a supply of 6,050, the demand was too weak to clear the market, and prices declined by a full $\frac{1}{2}$ d. per lb. for the first quality.

There was very slight alteration in the country markets the first week, and 8d. per lb. for best Downs was quoted at three, while at Derby it was 8 $\frac{1}{2}$ d., and at Dorchester, for Southdowns, 8 $\frac{1}{4}$ d. was reported. In the second week the trade generally was worse, and a decided fall took place in several places, the lowest quotation being 6 $\frac{1}{2}$ d. at Shrewsbury and Wellington. In the third week there was a slight rally at Leicester, Shrewsbury, and Wellington, but such improvement in the tone as was shown at these markets was far more than counterbalanced at other places. At the last January market at Islington, on the 25th, with nearly 6,000 sheep on offer, there was again a very weak demand, although it would be difficult to find a better lot for quality. On such exceptional occasions, and in a market situated like that of Islington, where sales are almost imperative at some price, the quotations often fail to give an adequate idea of the situation. One salesman on the day in question was heard by the writer to say he would take 6d. per lb., dead-weight, for a fine lot of half-bred tegs weighing about 80 lb., if he could obtain the offer, rather than hold them over. The finest small Hampshires barely realised 7 $\frac{1}{2}$ d., and large numbers of Oxfordshire and Norfolk Downs of 72 lb. were sold at 7d. per lb., while ewes were said to have fetched as little as 4d. A few West Country lambs were sent to the London market during the month, but they met with such little encouragement that there were none offering on this last day. Those half-bred Dorsets which have arrived have had to be sold at 8 $\frac{1}{2}$ d. per lb. It is reported that the root crop in the West of England is disappearing rapidly, and that shortness of keep is forcing many tegs on the market, thus keeping up the appearance of larger supplies than are really available.

Fat Pigs.—During the first week there was a firm trade for fat pigs, with a tendency to higher prices. This continued through the following two weeks, in spite of a rather plentiful supply. Bacon pigs of neat size have been fetching 8s. 9d. to 9s. per score, and porkers 9s. to 9s. 6d.

Veal Calves.—There were very few veal calves on offer at the beginning of the month, especially in London, but later on there was a better supply for a time of year when veal is considered out of season. In several country markets calves have been dear, and have fetched from 8d. to 8 $\frac{1}{2}$ d., and, in a few cases, 9d. per lb.

Carcase Beef.—With some fluctuations in values, the trade for all the best qualities of beef in the London market has been satisfactory. Scotch and English, as well as port killed, sold at high rates during the first week, starting at 7 $\frac{1}{2}$ d. to 7 $\frac{3}{4}$ d. per lb. for short, and 6 $\frac{1}{2}$ d. to 6 $\frac{3}{4}$ d. for long Scotch sides, English at 6d. to 6 $\frac{1}{2}$ d., and port killed

at $5\frac{3}{4}d.$ to $6\frac{1}{4}d.$, against $4\frac{1}{2}d.$ to $4\frac{3}{4}d.$ for the average of fore and hind quarters of American chilled. As such a large proportion of our supplies of carcase beef comes from Argentina, it becomes important to notice the difference in its quality from that of States chilled. This is always very considerable, if we may judge by their relative values in the London market. During the week in question Argentine chilled was only worth $3\frac{3}{4}d.$ to $3\frac{7}{8}d.$ per lb. for the whole carcase. Frozen beef varies very little in price, and is hardly influenced by the fluctuations in other classes, or at most to a very small extent. Contemporarily with the above quotations, New Zealand frozen beef was fetching an average of $3\frac{1}{4}d.$ per lb., or nearly as much as Argentine chilled. There was a fall in the value of British beef in the second week of about $\frac{1}{4}d.$ per lb., but imported was firm all round. In the third week English further declined $\frac{1}{2}d.$, and port killed gave way about $\frac{1}{4}d.$ On the other hand, chilled, both from the States and Argentina, was in short supply, and prices advanced from $\frac{1}{2}d.$ to $\frac{1}{3}d.$ per lb. Some interest was created by the arrival of some fine sides from Dublin, whence it is proposed to send carcase beef as an experiment. This consignment was of good quality, but, being rather large four-year-old bullocks, they did not make quite the top quotation, fetching, however, $5\frac{3}{4}d.$ per lb. The month closed with a firm trade, with very slight alteration in prices, chilled beef being still scarce and relatively dear.

Carcase Mutton.—The leading feature of the mutton trade was the cessation of the Dutch supplies. Their place, however, has been fully taken by very heavy consignments from Scotland. The Scotch sheep have been held back to a very great extent, but, the root crop running short, they have had to be sent forward during January in unusually large numbers. The trade was moderately firm the first week, with Scotch and English fetching $6\frac{1}{2}d.$ per lb., but prices declined later, and finished at about the lowest point yet touched, prime small Scotch tegs not exceeding $6\frac{1}{2}d.$, and fine English $6d.$ per lb., while large numbers of good Scotch sheep, weighing about 72 lb., were sold as low as $5\frac{1}{2}d.$. Early lambs were also much neglected, with the best at about $10d.$ per lb.

Store Stock.—There has been a very good demand for forward store cattle, and it is estimated that they are fetching from 10s. to 15s. per head more than last year at the same period. When sales have been slow, it has been owing to the high prices demanded, and a good spring trade is generally expected. Good two-year-old Shorthorns easily made from £14 to £15 per head, and yearlings about £10. Long prices have also been given for weaning calves, as much as 50s. to 60s. each being realised at several markets. Dairy cows have also fully maintained their value. There has been no improvement in the demand for store sheep.

THE PROVISION TRADE IN JANUARY

HEDLEY STEVENS.

Bacon.—The year opened with a very much improved demand for both bacon and hams, buyers apparently realising that prices for all cuts of American were low. According to advices received from the United States, they appeared to be below the cost of production. About the third week of the month, prices generally hardened, and a fair

amount of business passed even at the advance demanded by sellers. There has also been more contracting done for American meats for shipment, but most of the packers refuse to sell beyond January and February shipments, unless at a big premium.

Danish bacon arrived in smaller quantities, and agents were able to secure higher prices, but by the end of the month killings were reported to be larger. Arrivals of Canadian continued to diminish, being exceptionally small towards the latter end of the month. This was due to Canadian hogs still being so scarce, and, consequently, high in price. Spot prices advanced several shillings during the month.

There has been a very fair trade in English and Irish bacon. Curers report a difficulty in obtaining light English pigs, especially in the West of England.

In reviewing the last year's trade in imported bacon, Denmark shows an increase over the previous year of more than 244,000 cwt., and 587,000 over 1906. American also shows an increase of 260,000 cwt. over last year, when arrivals were below the average. Canada showed a decrease of nearly 190,000 cwt.

Cheese.—This article also participated in the improved trade early in the month, and holders were easily able to realise 1s. to 2s. advance, the demand being chiefly for the under-priced lots. Summer makes have been mostly cleared, so that buyers had to turn their attention to the cheaper parcels of the late made goods. Around the middle of the month some sales were made by Montreal houses at prices ranging from 59s. to 61s.

At the end of the month the demand was not so good, and holders showed willingness to meet buyers to a slight extent in prices, more especially in the cheaper selections. Advices from the Canadian shipping points report stocks clearing fast, and as likely to be considerably below the average at the end of the month.

Arrivals of New Zealand have been large, and sales have been pushed to avoid, if possible, an accumulation of stock. Quantities far in excess of last year are reported to be in transit, most of which have been contracted for at high prices. Some recent arrivals have shown unsatisfactory quality.

There has been a fair trade in English cheese, though chiefly in the lower-priced lots. The latest advices from New York report best American cheese making equal to 68s.-70s. per cwt.

Butter.—Early in the month the demand improved and prices advanced a little, chiefly influenced by the anticipated temporary shortage of New Zealand, through the damage by fire to the cargo of the ss. *Paparoa*. She had aboard 38,657 boxes (56 lb.), and out of these only about 7,000 were reported to be in fair condition, the rest being either jettisoned, melted, or only fit for confectionery purposes, some selling at about 40s. to 50s. per cwt. Weather conditions in New Zealand are reported favourable, and a large make in progress.

Prices in Canada and United States were still very high, consequently there were no imports from these countries. States Specials were fetching about 156s. per cwt. in New York City.

Eggs.—The demand has continued good throughout the month, with no accumulation of stocks. Prices generally were above the average. At the end of the month merchants reported difficulty in obtaining sufficient supplies to fill their orders.

PRICES OF AGRICULTURAL PRODUCE.
AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND
in the Month of January, 1909.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK:—				
Cattle:—	per stone.*	per stone.*	per cwt.†	per cwt.†
Polled Scots	8 5	7 11	39 9	36 10
Herefords	8 4	7 10	—	—
Shorthorns	8 2	7 6	38 10	35 11
Devons	8 6	7 10	—	—
Veal Calves	per lb.* d.	per lb.* d.	per lb.* d.	per lb.* d.
	8½	7½	8½	6½
Sheep:—				
Downs	7½	6½	—	—
Longwools	7½	6½	—	—
Cheviots	7½	7½	7½	6½
Blackfaced	7½	6½	7	6
Cross-breds	7½	6½	7½	6½
Pigs:—	per stone.*	per stone.*	per stone.*	per stone.*
Bacon Pigs	s. d.	s. d.	s. d.	s. d.
Porkers	6 3	5 9	6 7	6 0
"	6 9	6 3	7 1	6 2
LEAN STOCK:—				
Milking Cows:—	per head.	per head.	per head.	per head.
Shorthorns—In Milk ...	£ s.	£ s.	£ s.	£ s.
" —Calvers... ...	21 14	18 6	21 10	17 12
Other Breeds—In Milk ...	18 6	14 13	19 2	16 5
" —Calvers ...	—	—	19 19	16 13
Calves for Rearing	2 4	1 15	2 12	1 19
Store Cattle:—				
Shorthorns—Yearlings ...	10 8	8 19	9 14	7 18
" —Two-year-olds ..	14 2	12 4	14 6	11 14
" —Three-year-olds	16 16	14 14	15 15	—
Polled Scots—Two-year-olds	—	—	15 3	13 5
Herefords— "	15 4	14 2	—	—
Devons— "	15 0	12 17	—	—
Store Sheep:—				
Hoggs, Hoggets, Tegs, and Lambs—	s. d.	s. d.	s. d.	s. d.
Downs or Longwools ...	39 4	33 0	—	—
Scotch Cross-breds ...	—	—	26 9	23 2
Store Pigs:—				
Under 4 months	21 11	16 1	19 5	15 11

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in
ENGLAND and SCOTLAND in the Month of January, 1909.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birming-ham.	Man-chester.	Liver-pool.	Glas-gow.	Edin-burgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	57 0	55 ·6	53 6	—	60 0*	58 0*
	2nd	54 0	51 6	49 6	—	56 0*	52 0*
Cow and Bull ...	1st	42 0	48 6	45 6	42 6	45 0	45 6
	2nd	30 6	42 6	41 0	38 0	39 6	39 6
U.S.A. and Cana-dian :—							
Port Killed ...	1st	57 0	54 0	51 6	53 6	53 6	—
	2nd	52 6	49 0	48 0	49 0	49 0	—
Argentine Frozen—							
Hind Quarters...	1st	32 0	32 0	31 0	31 0	35 0	32 6
Fore ,,,	1st	28 6	28 6	27 6	27 0	28 0	27 6
Argentine Chilled—							
Hind Quarters...	1st	46 0	46 6	45 0	46 0	48 0	47 6
Fore ,,,	1st	32 0	32 6	32 6	32 0	34 0	34 6
American Chilled—							
Hind Quarters—	1st	58 6	57 6	57 6	57 0	53 6	59 0
Fore ,,,	1st	36 6	38 0	38 0	38 0	38 6	39 0
VEAL :—							
British	1st	65 6	62 6	70 0	78 0	—	—
	2nd	60 6	54 0	64 0	72 6	—	—
Foreign	1st	66 6	—	—	—	64 6	—
MUTTON :—							
Scotch	1st	60 0	64 0	66 0	69 0	62 0	54 0
	2nd	54 0	56 0	61 0	64 6	43 0	43 6
English	1st	57 6	64 6	63 0	63 6	—	—
	2nd	53 0	55 6	58 6	59 0	—	—
U.S.A. and Cana-dian—							
Port killed ...	1st	—	—	—	—	—	—
Argentine Frozen ...	1st	30 6	31 0	30 6	30 6	—	31 0
Australian ,,,	1st	28 6	29 6	28 0	28 0	—	—
New Zealand ,,,	1st	37 6	—	—	39 6	—	—
LAMB :—							
British	1st	94 6	—	—	—	—	—
	2nd	—	—	—	—	—	—
New Zealand ...	1st	53 0	56 0	48 0	48 0	55 0	—
Australian ...	1st	39 6	49 6	39 6	41 6	—	—
Argentine ...	1st	43 0	43 6	39 0	41 0	—	46 6
PORK :—							
British	1st	56 0	59 6	62 6	63 0	56 0	58 6
	2nd	49 0	55 0	57 6	58 6	53 0	50 6
Foreign	1st	56 0	59 0	60 0	60 0	—	—

Scotch.

AVERAGE PRICES of British Corn per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1907, 1908 and 1909.

Weeks ended (in 1909).	WHEAT.			BARLEY.			OATS.		
	1907.	1908.	1909.	1907.	1908.	1909.	1907.	1908.	1909.
Jan. 2 ...	26 0	35 1	32 0	23 11	26 9	26 7	17 3	18 4	17 4
,, 9 ...	26 1	35 2	32 9	24 2	26 9	26 11	17 4	18 3	17 5
,, 16 ...	26 1	35 5	32 8	24 1	27 1	27 1	17 5	18 5	17 5
,, 23 ...	26 2	35 6	33 2	24 5	26 11	27 3	17 5	18 5	17 8
,, 30 ...	26 3	35 0	33 0	24 4	26 11	27 6	17 5	18 4	17 9
Feb. 6 ...	26 6	34 3	33 4	24 5	26 9	27 7	17 7	18 3	17 10
,, 13 ...	26 7	33 1	33 1	24 1	26 9	27 7	17 9	18 0	
,, 20 ...	26 10	32 6	32 6	24 2	26 5	27 9	17 11		
,, 27 ...	26 9	30 11	30 11	24 2	26 3	27 9	17 8		
Mar. 6 ...	26 8	30 5	30 5	23 11	26 1	27 1	17 11	17 8	
,, 13 ...	26 10	31 3	31 3	24 2	26 0	27 8	18 0	17 10	
,, 20 ...	26 10	31 7	31 7	24 0	26 2	27 1	18 1	17 11	
,, 27 ...	26 8	31 4	31 4	23 9	25 10	27 2	17 10		
Apl. 3 ...	26 9	31 3	31 3	24 3	25 5	27 3	17 9		
,, 10 ...	26 8	31 2	31 2	23 9	25 10	27 6	17 7		
,, 17 ...	26 8	30 11	30 11	23 3	26 1	27 7	17 7		
,, 24 ...	26 10	30 10	30 10	23 3	25 5	27 9	18 9	17 9	
May 1 ...	27 0	31 6	31 6	23 6	25 8	27 3	18 0		
,, 8 ...	27 6	32 4	32 4	24 0	25 5	27 7	18 4		
,, 15 ...	28 4	33 1	33 1	23 10	24 9	27 1	18 7		
,, 22 ...	29 7	33 8	33 8	24 3	25 9	27 5	20 5	18 10	
,, 29 ...	31 4	33 5	33 5	24 0	24 6	27 8	20 8	18 8	
June 5 ...	32 0	33 1	33 1	24 7	25 10	27 7	18 4		
,, 12 ...	31 10	32 7	32 7	24 7	24 5	27 11	18 4		
,, 19 ...	31 4	32 0	32 0	24 11	24 2	27 9	18 5		
,, 26 ...	31 2	31 5	31 5	24 6	24 0	27 8	18 7		
July 3 ...	31 3	30 11	30 11	24 8	23 11	27 11	20 11	18 7	
,, 10 ...	32 0	30 5	30 5	24 10	24 4	27 11	18 5		
,, 17 ...	32 6	30 7	30 7	24 6	23 1	27 8	18 6		
,, 24 ...	32 11	31 5	31 5	27 3	26 5	27 8	18 6		
,, 31 ...	33 2	31 10	31 10	26 4	24 4	27 2	21 2	18 7	
Aug. 7 ...	33 5	31 6	31 6	26 6	23 1	27 3	21 3	18 9	
,, 14 ...	33 6	31 6	31 6	25 9	23 10	27 4	20 4	18 1	
,, 21 ...	33 7	31 2	31 2	25 0	24 5	27 8	19 8	17 10	
,, 28 ...	33 10	30 10	30 10	24 6	24 5	27 11	18 1		
Sept. 4 ...	31 11	30 10	30 10	24 2	25 5	27 7	17 6		
,, 11 ...	31 4	31 5	31 5	24 4	25 11	27 6	17 6		
,, 18 ...	31 5	31 7	31 7	25 0	26 0	27 6	17 6		
,, 25 ...	31 8	31 5	31 5	25 3	26 8	27 8	17 8		
Oct. 2 ...	32 6	31 7	31 7	25 5	26 11	27 9	17 2		
,, 9 ...	33 3	31 5	31 5	25 9	27 5	27 11	17 0		
,, 16 ...	34 4	31 2	31 2	26 3	27 6	28 0	17 0		
,, 23 ...	35 9	30 11	30 11	27 2	27 5	28 7	16 11		
,, 30 ...	36 3	30 8	30 8	27 7	27 5	28 10	16 11		
Nov. 6 ...	35 10	30 11	30 11	27 8	27 6	28 10	17 0		
,, 13 ...	35 1	31 2	31 2	27 8	27 4	28 8	17 0		
,, 20 ...	34 7	31 10	31 10	27 5	27 3	28 9	17 3		
,, 27 ...	34 7	32 3	32 3	27 5	27 2	28 7	17 5		
Dec. 4 ...	34 7	32 7	32 7	27 1	27 2	28 6	17 4		
,, 11 ...	34 8	32 8	32 8	27 0	27 0	28 5	17 4		
,, 18 ...	34 9	32 9	32 9	27 1	26 9	28 3	17 3		
,, 25 ...	34 6	32 2	32 2	26 10	26 8	28 0	17 2		

NOTE.—Returns of purchase by weight or weighed measure are converted to Imperial Bushels at the following rates: Wheat, 60 lbs.; Barley, 50 lbs.; Oats, 39 lbs. per Imperial Bushel.

AVERAGE PRICES of Wheat, Barley, and Oats per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

	WHEAT.		BARLEY.		OATS.	
	1908.	1909.	1908.	1909.	1908.	1909.
France : January	39 5	38 0	26 0	25 10	18 2	20 1
Paris : January	39 0	39 3	26 2	23 3	19 4	20 5
	1907.	1908.	1907.	1908.	1907.	1908.
Belgium : November	35 2	33 8	27 0	25 1	21 6	19 11
	December	34 5	32 4	26 11	25 7	21 6
Germany : November	48 5	41 10	32 2	31 0	24 4	21 11
	December	46 2	42 3	30 10	30 1	23 4
Berlin : November	48 5	44 3	—	—	24 7	23 0
	December	46 9	44 8	—	23 9	22 7
Breslau : November	47 4	40 11	32 6 (brewing)	31 6 (brewing)	22 2	21 1
	December	45 6	40 5	27 5 (other)	26 0 (other)	21 6
			31 7 (brewing)	30 8 (brewing)	20 8	
			27 9 (other)	26 9 (other)		

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*; the prices for the German Empire representing the average of the prices at a number of markets. The mark is now taken as equal to 11'8d., and the German prices for the former year have been recalculated on this basis.

AVERAGE PRICES of British Wheat, Barley, and Oats at certain Markets during the Month of January, 1908 and 1909.

	WHEAT.		BARLEY.		OATS.	
	1908.	1909.	1908.	1909.	1908.	1909.
London ..	36 3	34 0	26 7	20 11	19 6	18 7
Norwich ...	35 7	31 10	27 0	26 1	18 4	17 2
Peterborough ...	35 0	32 2	26 0	26 4	18 0	17 2
Lincoln... ..	35 7	32 7	27 1	27 11	18 1	17 1
Doncaster ...	34 8	32 2	26 8	27 11	18 3	17 2
Salisbury ...	34 9	32 8	26 3	28 1	17 9	17 5

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain
MARKETS in ENGLAND and SCOTLAND in the Month of
January, 1909.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Bristol.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
BUTTER :—	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
British .....	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
... 15 6	14 0	15 0	14 0	—	—	—	15 0	—
Irish Creamery .....	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
... 114 0	111 6	113 6	111 0	98 6	104 0	98 0	108 0	—
" Factory	104 0	99 6	108 0	—	—	—	—	—
Danish	115 6	113 6	—	—	116 6	113 6	113 6	—
Russian	104 0	100 0	106 6	99 6	106 0	101 0	103 6	98 6
Canadian	—	—	110 0	105 0	109 0	104 0	—	—
New Zealand	115 6	112 6	116 0	112 0	114 6	111 6	114 0	—
CHEESE :—								
British—								
Cheddar ...	81 0	70 0	74 0	62 0	77 0	71 6	66 0	63 0
... 120 lb.	120 lb.	120 lb.	—	—	120 lb.	120 lb.	—	—
Cheshire ...	83 6	72 0	—	—	78 6	69 0	—	—
per cwt.	—	—	—	—	per cwt.	per cwt.	—	—
Canadian ...	62 6	61 6	62 6	60 6	62 6	60 6	63 0	60 6
BACON :—								
Irish ...	60 6	56 6	60 6	54 0	57 6	54 6	65 6	60 0
Canadian ...	55 6	54 0	54 6	51 6	53 0	50 6	55 6	53 0
HAMS :—								
Cumberland ...	100 0	87 6	—	—	—	—	—	—
Irish ...	95 6	87 0	—	—	—	—	89 6	77 6
American (long cut) ...	48 6	47 6	48 0	46 0	48 0	43 6	49 6	47 6
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British ...	17 6	15 0	15 0	—	—	—	—	—
Irish ...	14 4	13 0	14 0	12 11	14 3	13 0	14 9	12 7
Danish ...	15 3	12 10	—	—	—	—	15 4	12 9
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Langworthy ...	72 6	62 6	75 0	65 0	83 6	75 0	48 6	42 6
Scottish	—	—	—	—	—	—	—	—
Triumphs ...	60 0	50 0	65 0	55 0	43 6	38 6	—	—
Up-to-Date ...	60 0	50 0	61 0	50 0	43 6	38 6	41 0	37 6
HAY :—								
Clover	86 6	72 0	72 6	—	85 0	62 6	66 0	60 0
Meadow	70 6	55 6	65 0	—	—	—	55 0	50 0

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER OF OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	JANUARY.	
	1909.	1908.
Swine-Fever:		
Outbreaks	159	155
Swine Slaughtered as diseased or exposed to infection ...	1,043	672
Anthrax:		
Outbreaks	139	135
Animals attacked	181	200
Foot-and-Mouth Disease:		
Outbreaks	—	—
Animals attacked	—	—
Glanders (including Farcy):		
Outbreaks	49	84
Animals attacked	105	292
Sheep-Scab:		
Outbreaks	190	291

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	JANUARY.	
	1909.	1908.
Swine-Fever:		
Outbreaks	3	17
Swine Slaughtered as diseased or exposed to infection ...	12	347
Anthrax:		
Outbreaks	1	1
Animals attacked	1	1
Glanders (including Farcy):		
Outbreaks	—	—
Animals attacked	—	—
Sheep-Scab:		
Outbreaks	85	107

SELECTED CONTENTS OF CURRENT PERIODICALS

Journal of Agricultural Science. Vol. III. Part I.

The Rate of Fermentation of Ciders and Perries, *B. T. P. Barker*; The Mineral Constituents of Foods, *Herbert Ingle*; The Action of Heat and Antiseptics on Soils, *Spencer U. Pickering*; The Yeast Flora of Bottled Ciders, *Elsie B. Pearce* and *B. T. P. Barker*; The Genetic Classification of Soils, *N. M. Tulaikoff*; On the Inheritance of Strength in Wheat, *R. H. Biffen*; On a Method of Checking Parasitic Diseases in Plants, *M. C. Potter*.

Science Progress, January, 1909.

The Destruction of Wood by Fungi, *A. H. Reginald Buller*; The Chemistry of Chlorophylii, *S. B. Schryver*; The Evolution of Animal Function, *Keith Lucas*.

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NARCISSUS CULTIVATION.

JAMES WAUGH.

Until ten or twelve years ago the Dutch had almost a monopoly of the bulb trade of this country, but recently bulb cultivation has been successfully undertaken in various parts of the British Isles, and the new industry thus created has brought prosperity to several districts.

Districts where Bulbs are Grown.—In the Channel Islands bulb culture is one of the chief industries, and during the spring months tons of bloom are daily despatched to London and other large centres, to be followed in summer by the further despatch of tons of bulbs. In the South Lincoln and Cambridgeshire Fens many acres of bulbs are now grown, several of the larger growers having from twenty to fifty acres under cultivation. An ideal bulb soil is found here, which, with good culture, will produce bulbs equal to those grown in Holland, and, in addition to supplying a home demand, a considerable export trade is now being conducted from this centre.

In the South of England narcissus cultivation has been receiving the attention of enthusiasts for years, and from this source many of the newer and more expensive introductions of recent years have been sent. In the Midland Counties several nurserymen and amateur specialists are successful cultivators, and this year bulb-growing is being tried on commercial lines at Portmadoc, in North Wales. In Ireland also narcissi are now successfully and extensively grown in

localities so far apart as County Down in the north, Cork in the south, Dublin in the east, and Sligo in the west.

Suitability for Small Holdings.—From this it will be gathered that, given suitable soil and cultural knowledge, narcissi can be grown successfully in almost any part of the British Isles. Their culture may be undertaken by those occupying small holdings and allotments, and in conjunction with other crops they may be grown with every prospect of yielding the grower a profitable return on his capital. The present article is intended to give such holders an indication of the elementary principles of bulb culture, dealing first with the growth of bulbs for sale as bulbs, and secondly as blooms.

Growing Bulbs for Sale.

Suitable Soils.—The soil best suited for narcissus cultivation is a deep, friable loam. Stagnant moisture is detrimental to the plants, and where such a condition exists it must be remedied by draining and raising the beds above the level of the paths. All the varieties recommended below will flourish in loam, and some few will succeed in somewhat stiffer soil.

Preparation of Soil.—Land from which an early crop of potatoes has been lifted furnishes a very suitable soil for narcissi. When preparing it for the potato crop, the land ought to receive a heavy dressing of farm-yard manure, from fifty to sixty tons per acre, according to the condition of the soil. As soon as the potatoes are cleared off, at the end of July or beginning of August, the land should be deeply ploughed or dug so that the enriched top spit is placed in a position to allow the roots of the narcissi to penetrate freely. If it is infested by weeds such as twitch, bindweed, thistles, docks, &c., these ought to be removed as the work proceeds, as it is impossible to eradicate such pests once the bulbs are planted; a determined effort must therefore be made to remove them before the bulbs are put in the soil. If the work has been done by the plough the ground should be broken up by harrowing and rolling, but if dug by the spade it should be broken up as digging proceeds. This accomplished, and a good tilth obtained, the land is

then ready for planting. The soil should be uniformly level, as hollows in which water stands injuriously affect the bulbs.

Manures.—Fresh farm-yard manure must never be used in connection with narcissus cultivation; its ammoniacal constituents have an injurious effect upon the plants, and this is the chief reason for recommending that they should follow such a crop as potatoes, where the rankness of a heavy manuring has already expended itself. Some may think sixty tons of farmyard manure per acre an unnecessarily large amount, but unless the ground is in good condition this is no excessive quantity. Good bulbs, like most other crops, cannot be grown on poor land. If it becomes necessary to plant on land which has not recently been well manured, bone-meal is probably the best artificial manure to use at time of planting. This should be applied at the rate of ten to fifteen cwt. per acre, and can either be harrowed and raked in before planting commences, or worked in as planting proceeds.

Time of Planting.—As a general rule, the shorter the period the bulbs are out of the ground the better. In some cases, such as the *Poeticus* section, new roots are formed simultaneously with the drying of the old, and a decided injury is done by keeping such varieties out of the ground for a lengthened period. Nevertheless, narcissi, with few exceptions, may be planted as late as Christmas, and still give fair results; but the best time for general planting is during August and September, and all planting should certainly be finished during October. The ground should be dry and friable at the time of planting, which should be done at a depth of two to four inches—the larger bulbs at the greater depth, and the smaller ones proportionately shallower.

Methods of Planting.—Various methods of planting are adopted, and the amount of space to be planted will influence the method decided upon. Many large growers use a one-horse plough, to which is fixed a special share that works in the bottom of the furrow and makes the necessary impression for the reception of the bulbs; and on large establishments the work is expeditiously performed in this way. From twenty-four to thirty planters are necessary to keep the plough constantly at work, and an acre a day may be planted. The cost would be:—Man and horse per day, 8s.;

thirty planters at 2s., £3; man in charge, 4s.; total, £3 12s. per acre.

The above method is suitable where any one variety of bulb is being planted in large quantities. The work proceeds in the ordinary way of ploughing, one furrow covering the already planted bulbs in the furrow previously made. The furrows are about nine or ten inches wide, and every seventh furrow is left unplanted, and this forms a path, which is necessary for getting among the bulbs when bloom-gathering, cleaning, &c.

Where smaller areas are being planted, a different method must be adopted. First divide the land into suitable divisions, say fifty feet wide, with eighteen-inch paths between. Then stretch a line across the end of the first division, and with a spade throw out a shallow opening in which to plant the first row of bulbs. This done, shift the line the width of the rows, say nine inches; then proceed to open the second furrow, covering the first and already planted row with the soil from the second. Proceed thus with succeeding rows, again leaving every seventh unplanted to form a path. By this method one man with a spade will keep two planters busy, and the cost will be about £6 per acre.

Another method for the small grower, after he has marked his land into fifty-foot divisions with eighteen-inch paths, is to mark each division across with beds 3 feet 6 inches wide and with paths 12 inches wide. The soil from the first bed is taken out to a depth of 3 inches and wheeled to the far end of the division; this first bed is then carefully raked, and marked across in rows 6 inches apart. The bulbs are then planted, and this bed is covered with soil taken from the second bed, and so the work proceeds to the end of the division. This method, although a little more expensive than the preceding, has advantages, especially where handling a considerable number of varieties in small quantities, as the danger of mixing sorts is less likely to arise.

The quantity of bulbs necessary to plant a given area will vary considerably, according to the size of bulb produced by the particular variety. From five to six tons may be taken as an average weight to plant an acre.

Cultivation between Planting and Harvesting.—The chief

labour involved is in keeping the ground clean, and the amount of labour necessary varies according to the condition of the land and the weather. When planting has been done early, say in August or September, weeds will soon begin to show. These can be kept in check by hoeing (large growers use horse labour), provided the weather is favourable. If it is showery, so that hoeing is not effective, the land must be lightly "pointed," *i.e.*, shallow-dug, in order to bury the weeds. For this work a broad-tined fork is the best tool to use, and the most suitable time to perform this work is at the end of October or beginning of November. If performed earlier there is the risk of another crop of weeds appearing; if done later, the bulbs may be too far advanced, and damage may result in consequence.

During the winter months some growers protect their bulbs from frost by covering the ground with heather or other loose litter, but for the varieties to be recommended this labour is unnecessary. In February, before the foliage pushes through the ground, soot may be applied broadcast and lightly harrowed or raked in. This is especially recommended where bulbs have remained in the same position two or three years.

During the spring months weeds must be kept in check by hoeing and hand-weeding, taking care that the least possible damage is done to the foliage. Treading on the beds is to be avoided as much as possible. When the foliage dies down, if the bulbs are to remain another year, the whole area should be hoed over, and this operation should be repeated two or three times during the summer months, which is all the attention necessary until the period for autumn "pointing" again returns.

Harvesting.—As soon as the foliage has died down, a start must be made to raise those bulbs which it is desirable to lift. No time must be lost in this work, as in the event of showery weather fresh roots will very soon be produced, and the aim of the grower is to get his bulbs out of the ground whilst root-growth is dormant.

Many large growers use the plough for lifting as well as planting. By its use a careful and experienced ploughman and a sufficient number of pickers can lift large areas

very expeditiously at a lower cost than where forks are used, while less damage is done and fewer bulbs are left in the land. The smaller grower, however, must resort to the fork. The bulbs as lifted should be put in shallow trays or baskets, and placed in a cool, airy shed to dry, if such is available. If this shelter cannot be given them, they may be allowed to lie on the ground until they become dry and clean. They must not, however, be allowed to remain too long, in case they get scorched by strong sunshine. The length of time necessary must depend upon the condition of the bulbs when lifted and the weather experienced, but once they are in a fit condition no time should be lost in getting them under cover, as if showery weather sets in root-growth will very quickly commence, and this must be prevented. All lifting should be finished by the end of July at the latest.

The weight of produce lifted must necessarily depend upon the fertility of the soil, the variety grown, and the length of time the crop has been planted, but ten to twelve tons per acre may be regarded as an average yield, or about double the weight planted.

Preparation for Market.—Various methods of marketing are employed. Bulbs may be sold as lifted, large and small together, by the cwt. or ton, and many people (especially planters) prefer to buy their bulbs in this way. Retailers, however, and wholesale dealers who supply retailers, require first- or second-sized shapely bulbs only. It then becomes necessary to clean and size the produce, making four different sizes, viz., first or "heads"; seconds; thirds or "planting" size; and "chips." First-size bulbs of the popular varieties can be readily sold to bulb merchants by the 1,000, and the other sizes should be kept for planting purposes.

In growing for bulb production a more frequent course of transplanting is necessary than when bloom is the chief object, and nice, shapely bulbs, such as are wanted for shop sales, can only be obtained by regularly transplanting. When first-size bulbs are planted they multiply and give increased stock, and it is well to let such remain two or even three years undisturbed. Second-size bulbs, if carefully sized, should yield "heads" (or firsts) after one year's growth. Thirds and "chips" require two years before attaining sale-

able size, and then half only may be fit to be classed as "heads."

This sizing requires the exercise of some discretion, as by its careful performance much unnecessary labour may be saved. Thus the grower who sizes and plants what he hopes to lift as first-size bulbs after one year's growth incurs needless labour and expense if only fifty per cent. of the produce attains first size. A very little experience, however, will suffice for the alert cultivator, and he will be able to estimate from the bulbs planted what quantity of different sized produce he will have for disposal each year.

Varieties to Cultivate.—It is only proposed to recommend the popular or what are usually termed "market" varieties, viz., those that are best suited for the profitable production of outside bloom and for forcing under glass. The demand which has arisen in recent years for flowers for house decoration has created quite a large industry in bulb forcing, and as the demand for varieties suited for this purpose is greater than for the numerous varieties grown by the bulb specialist, these are more likely to prove remunerative to the allotment holder. Of course, when growing for bulb production the bloom is also marketed in spring, so that profits both from bloom and bulbs are obtained.

1st. *Golden Spurs*.—A deep rich yellow trumpet. The first to bloom of those recommended, and a variety extensively grown for forcing. Wholesale price for first-size bulbs varies from £1 10s. to £1 15s. per 1,000. All sizes as lifted from £35 to £40 per ton.

2nd. *Incomparabilis Sir Watkin*.—A large handsome flower with primrose perianth and yellow cup. A strong grower and a good force. Wholesale price for first-size bulbs from 25s. to 30s. per 1,000. All sizes as lifted from £25 to £30 per ton.

3rd. *Emperor*.—A noble trumpet variety, having a deep primrose perianth and yellow trumpet, large flower, and a very strong grower. Wholesale price for first-size bulbs from 25s. to 30s. per 1,000. All sizes as lifted from £20 to £25 per ton.

4th. *Bicolor Horsefieldii*.—A free flowering variety with white perianth and yellow trumpet. Wholesale price for first-

secured. This gives a much quicker return on capital than is possible when first-size bulbs only are planted, and the initial outlay is also less.

Value of Produce.—This will vary according to the varieties grown, the quantity and quality of bulbs planted, length of time they have been allowed to remain in the ground, and, lastly, suitability of the land for bulb culture. As the different varieties vary so much in value, the best method of arriving at an estimate will be by percentage increase on cost of "seed" bulbs. Bulbs planted one year will increase from 30 to 50 per cent. in value; those planted two years from 75 to 100 per cent.

Besides, there is the cut bloom which must be taken into consideration, and this may be expected to add from £15 to £20 per acre to the profits.

Cultivation for Bloom.

The chief difference in cultivation when growing for cut flowers is that less frequent lifting and replanting is necessary. The bulbs may remain two or three years—some few varieties even longer—and increase their yield annually. As a rule, however, after remaining three years, a shift is desirable, as the bulbs then become crowded and too small to bloom satisfactorily, while the land also becomes exhausted. The labour required for keeping the land free from weeds is the same as when growing for bulbs, but the annual cost of lifting, cleaning, sizing, and replanting is saved.

Marketing the Bloom.—As the blooms expand they must be gathered and marketed whilst fresh. An effort should be made to have the bloom fit for market earlier than would be the case if left to take its natural course. This can be accomplished by pulling the flower when in the bud state and opening it in water under glass, or by erecting a temporary covering of glass lights if these are available. The grower without glass is at a great disadvantage, and glass is absolutely necessary to obtain the best results, as without a greenhouse the grower is at the mercy of the elements at a time when much rough and stormy weather is frequently experienced. The cultivator with glass at his disposal can

gather the flowers in the bud state, open them in water, and thus ensure all his bloom reaching the market clean and in good condition.

To avoid glutted markets, it is sometimes desirable to prolong the bloom for a few days; this is done by placing the buds in water in a cool, shaded shed. The best receptacles in which to place the blooms are narrow troughs or boxes divided into several sections each about four inches wide.

In the Fen district the work of gathering and bunching is generally done by women and boys. The gathering should be done by boys whenever possible, as the women's skirts cause considerable damage among the growing blooms. As the bloom is gathered it is placed upright in boxes or baskets, then taken to the bunching room, where it is tied into bunches of twelve blooms each by the women workers. The aim of the buncher is to have all the blooms facing one way without presenting a crowded appearance, and the addition of a little narcissus foliage to each bunch is a considerable improvement. Foliage, however, must not be indiscriminately cut from the growing crop. Only a leaf or two should be selected from each plant; or a cheap, vigorous variety such as single Incomparabilis may be grown purposely for the supply of foliage. The bloom when cut is benefited by having one night in water before being packed, and, in any case, it should certainly have an hour or two in water before being put into the boxes. The flowers then reach their destination in a much fresher condition than if cut and packed forthwith.

Most commission salesmen supply boxes, and into these a certain number of bunches are put. All boxes should be papered, allowing sufficient paper to project over the sides and ends to cover the bloom completely when packed. The boxes should not be unduly crowded, as a lesser number of bunches nicely tied and carefully packed will realise more than an increased number of bunches crowded into a similar box. A small label stating the contents of the box should be tacked outside each, and the boxes then tied in bundles of two or three together. The work of gathering, bunching, and packing is generally done by the piece or per gross, and

the cost will vary according to the rate of pay in the district, condition of crop, &c. From 1s. to 1s. 3d. per gross bunches will be an average price. The important points are to get the stems as long as possible, to stand them in water before packing, to bunch and pack them carefully, and not to over-crowd the boxes.

Value of the Crop.—Market prices vary considerably, and it is impossible to estimate these accurately; 9d. to 1s. per dozen bunches may be taken as an average, although the small cultivator will find that where special attention is paid to careful picking, packing, and grading, rather higher prices will be obtained. It is in these details that the small holder scores an advantage over the large establishments, where the flowers are apt to be handled with a certain amount of carelessness.

INCOME.			EXPENDITURE.			
	L	s. d.		L	s. d.	
200,000 blooms per year for three years at 10 <i>½</i> d. per gross	182	5	Gathering, bunching, and packing bloom per year for three years at 1s. 6d. per gross bunches	26	0 9	
Value of bulbs at end of three years	200	0 0	Carriage and commission for three years at 40 per cent. on £182 5s. 9d. ...	72	18 3	
			Incidental expenses, clerical, &c., 5 per cent. on £182 5s. 9d. ...	9	2 3	
			Rent, rates, and taxes for three years	18	0 0	
			Manure	16	5 0	
			Soot (second and third years)	5	0 0	
			Preparation of land	4	0 0	
			Bulbs for planting ...	100	0 0	
			Cost of planting ...	6	0 0	
			Cleaning land (three years).	18	0 0	
			lifting bulbs	9	0 0	
			Profit on three years	97	19 6	
	<u>£382</u>	<u>5</u>	<u>9</u>	<u>£382</u>	<u>5</u>	<u>9</u>

Or an annual profit per acre of £32 13s. 2d.

In estimating the quantity of blooms obtainable from an acre considerable latitude must again be given, as the crop will vary according to varieties, good or indifferent culture, &c.; 200,000 blooms may be taken as an average yield per acre for the varieties specified, with the exception of *Ornatus*, which may be trusted to give two or three times that quantity. Assuming a crop of this size for a period of three years (the length of time the crop is on the land), the above estimate

may be regarded as applicable to the Fenland district, where, as stated above, less expense is incurred in some details than in other parts of the country.

It is evident from the above figures that bulb growing is a profitable industry, and there seems no reason why it should not be extended to many parts of the British Isles with every prospect of success.

SHOEING OF HORSES.

J. T. POWIS.

Farriery Instructor to Hampshire County Council.

In many rural districts County Councils have included instruction in farriery in their educational work, and travelling Instructors in Farriery visit the Agricultural Schools and also give courses of instruction at local centres. The students at the colleges thus acquire a knowledge of the principles of shoeing which is of practical value to them, while the local courses enable the instructors to influence those to whom farriery is a means of livelihood. The present article summarises the course of instruction which is generally given in these classes, and may therefore be useful to those who are concerned in the management of horses, but who are unable to take advantage of the practical instruction afforded.

Anatomy of the Foot.—The bones are situated in the centre of the foot, and are surrounded by soft sensitive structures, the objects of which are to produce a growth of horn on the foot. In the lowest extremity of the leg are situated the small bones, the coffin or pedal bone, and the navicular bone; the latter, together with the lower extremity of the short pastern or coronet bone, form the coffin or pedal joint.

The Coffin Bone.—The coffin bone may be described as a pyramid with a hollowed-out base, so situated as to cause the point or tip to be wedged into the toe of the foot, as may be seen in the accompanying illustration (Fig. 1). The sides or wings gradually extend in the form of a pyramid, and the back half or heel of the foot is left entirely devoid of bony formation.

The Navicular Bone.—The navicular bone is a small boat-

shaped formation to be found at the back of the central part of the coffin bone. It acts chiefly as a roller for the tendon (*Flexor perforans*), which curves round the back of the bone prior to its contact with the coffin bone.

The Coronet.—The coronet, or, as it is sometimes called, the short pastern, has a rounded base which oscillates to and fro in the hollowed-out base of the coffin bone. The surface of these two bones which come into contact in this manner are covered with a layer of gristle (articular cartilage) about one-eighth of an inch thick, and the whole articulation is

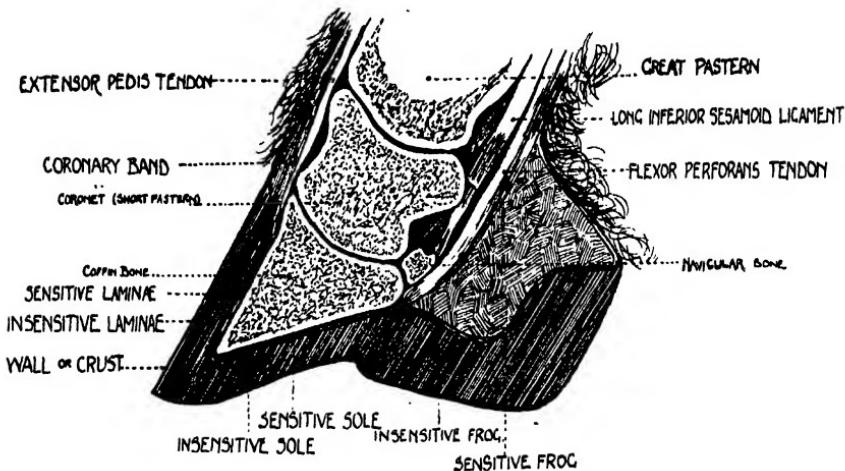


FIG. 1.

bathed in joint-oil (*Synovia*), which ensures ease and smoothness in movement.

The Lateral Cartilage.—This is a large springy piece of gristle, extending from the top of the coffin bone along each edge and curving round to the heel beyond. In fine-skinned horses its outline can be clearly discerned running along the sides of the coronet, and by pressing hard on its edge at the back of the heel its "spring" may be easily demonstrated.

Ligaments.—Ligaments extend from bone to bone, holding them firmly in position, and, at the same time, allowing entire ease of movement.

Tendons.—Tendons extend from the muscles at the top of the leg down the limb, both at the front and back, and are firmly attached to the bones; the *Extensor pedis* tendon runs down the front of the leg and spreads out over the short

pastern and the top of the coffin bone; at the back of the leg there are two, the *Flexor pedis perforans* and the *Flexor perforatus*; the former rolls over the navicular bone and is inserted into the coffin bone, and the latter is attached to the coronet bone.

The Frog Pad.—At the back of the foot, occupying the cavity which lies between the wings of the coffin bone and

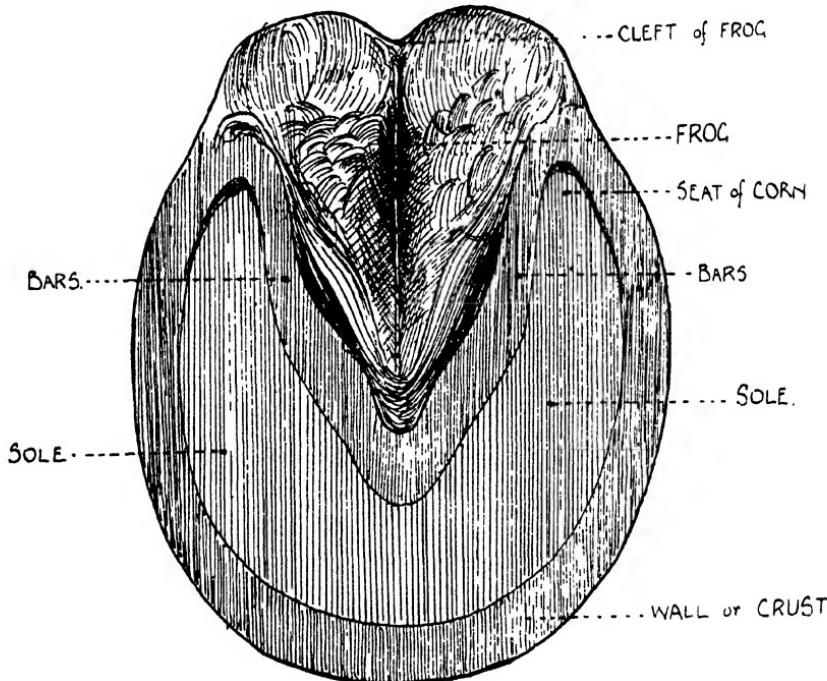


FIG. 2.

the lateral cartilages, is a thick, tough elastic pad, known as the frog pad, or sensitive frog, the object of which is to act as a cushion in lessening the shock to the column of bones.

The Wall or crust.—This is the term applied to the outer covering of the foot, the bars of which turn in at the heels, and continue down each side of the frog (Fig. 2). On the upper edge of the wall is a groove known as the coronary cavity, in which fits the coronary band, a species of fibrous substance, the object of which is to secrete the material necessary for the formation of the horny growth which builds up

the wall. The latter is of uniform thickness below this groove, but towards the quarters and heels it gradually gets thinner. A number of horny "leaves" are found lining the inner surface of the wall, the conformation of which is similar to that of the fleshy "leaves" which cover the coffin bone, and fit in with them like a dovetail. A thin band or ring, known as the periopic ring or frog-band, runs round the upper edge of the wall, and secretes the horn of the periople, which becomes very prominent when the foot is soaked in water.

The Sole.—The sole is similar in shape to the under surface of the pedal bone, and is slightly arched towards the centre. The insensitive sole grows from the sensitive sole above it, as may be seen in the illustration (Fig. 1), and when it attains a length of from a quarter to five-eighths of an inch it separates from the under surface of the sole, and becomes detached from the foot.

The Frog.—The frog may be described as a wedge-shaped piece of horn, the broad end of which fits in between the heels (Fig. 2). The horny or insensitive frog grows from the sensitive frog above it, and is nature's chief provision against concussion.

The above notes give the general formation of the horse's foot, and when the anatomy of this portion of the horse is thoroughly understood, the student will be provided with a good foundation upon which to build up his practical knowledge of farriery.

Manufacture of Shoes.—Shoes are made both by hand and by machinery, the first method being preferable. For hand-made shoes, the best material is to be found in bar iron, or, better still, old shoes turned over and welded up. The hammer and sledge must be used with considerable effect to render the shoes hard and tough and of a steely texture. Ordinary riding horses, hunters, and carriage horses require to be shod with a tolerably light shoe, wide enough to cover the weight-bearing structure of the foot. The shoe must be of uniform thickness and width, the former quality depending largely upon the particular structure of the foot to be shod; in all cases, however, it should be as thin as is compatible with durability for a month. Fore shoes are generally

seated out on the foot surface, and in some cases are made concave. The weight of shoes is a varying quantity, and depends largely upon the nature of the work undertaken; it must therefore be adapted to circumstances, but in all cases it must be remembered that the lighter the shoe, the easier it is for the horse. In many cases, especially where horses are employed chiefly on farm work, caulkins are used on the outside heels of the hind feet as a stay to the foot on heavy retentive land. The other, or inner heel, must, of course, be raised to a corresponding level, and in no cases should caulkins be applied to the fore shoes. Seven nails are sufficient for a well-fitted fore shoe, three on the inner edge and four on the outer edge of the shoe. For the hind shoe, seven or sometimes eight nails should be used.

The use of machine-made shoes is not to be recommended, as they do not receive that thorough hammering and welding which is essential for the production of a hard, tough unbreakable shoe. It will also be found in this class of shoe that the nail holes are all pitched at the same angle. On a careful observation of the foot, however, it will be seen that the foot inclines more towards the vertical in the quarter than it does in any other part of the foot, and hence this uniform angle of the holes in a machine-made shoe is an undesirable quality.

The use of steel shoes still finds many supporters, but the great disadvantage encountered in using them is that they become very smooth and slippery on the surface, thus rendering them dangerous on stone or wood pavings.

Preparation of the Hoof.—The farrier cannot pay too much attention to the preparation of the horse's foot before fitting the shoe. There are numerous points to be considered to ensure a well-shod foot, and the most important of these are the nature of the work undertaken by the horse, and the variety and quality of the land over which it is accustomed to travel. The foot should be carefully examined in order to notice any peculiarities which may be evident in the wear of the old shoes. Among these may be mentioned forging, stumbling, brushing, 'or interfering, speedy cutting, &c. Careful note should also be taken to see that the feet are evenly matched in pairs and are level, also to detect the presence of

high or low heels, long toes, dropped soles, or contracted heels. When these points have been noted and due consideration has been given them, the preparation of the foot may proceed. With a rasp remove from the ground surface of the wall any superfluous growth of horn, care being taken to lower the wall at the toe. The under surface must then be rasped quite level, and all sharp edges should be removed, as they tend towards splitting of the crust. The foot should then be ready for the application of the shoe.

Management of Colt's Feet.—Careful attention must be given to the feet of the young colt from the time of foaling to the fitting of the first pair of shoes. The feet should attain a regular and even growth, and should be perfectly matched in pairs. Great importance attaches to the angle at which the feet grow, the proper inclination of which should be similar to that of the pasterns when standing on level ground. Colts reared on hilly ground are very liable to irregular and uneven growth of feet, and if this defect is neglected the foot and the joints above it become permanently deformed, and the horse is practically ruined.

To avoid this, regular attention must be paid to the state of the feet week by week, and the rearer should remember to keep the toes at a uniform length and breadth, at the same time letting the heels down with a rasp in order to encourage frog pressure. The first shoes must not be fitted to a young colt until he has been educated to "give" his feet in proper order; a loud, bullying tone must never be used on a young horse, but he should be treated with every indulgence until he learns that he is not to be hurt; any sign of obstinacy must, however, be repressed.

Shoeing Farm Horses.—Many farm horses, especially those employed on small holdings or allotments, are frequently worked both on the land and on the road, and for this purpose a special method of shoeing must be adopted. A horse of this class should be shod every month, regardless of the fact that its shoes may not require renovating. This regular treatment of the foot becomes more essential when the horse is employed solely on soft, retentive land, as this gives rise to a somewhat faster growth, also rendering the feet liable to be misshapen.

When preparing the foot for shoeing, diseased horn or hard lumps must be cut out of the under surface of the sole, but care should be taken to prevent undue paring; the sole when fitted with a shoe should be as near the ground as possible, and when attached to the hoof the shoe must run flush from heel to heel, with the outer edge of the wall. Considerable discussion has arisen as to the proper width of shoe for a horse of this class, but about $1\frac{1}{2}$ in. may be taken as an average, the thickness being from one-half to five-eighths of an inch. The shoe must also be a little longer and broader at the heel than in other parts. The hind foot should be prepared in a similar manner, and the shoe best adapted for this purpose, in the writer's experience, will have a caulkin on the outer heel and a wedge heel inside; a horse having low heels will do better with a shoe having caulkins on both heels.

Animals employed solely on the farm or even on the roads do not require caulkins except in special cases, as these projections sometimes give rise to ugly wounds on the coronet when two horses blunder into each other in turning about. It may, however, be said that horses which are worked solely on the roads derive a certain amount of benefit from the use of caulkins on both heels, as these form a means of gaining a foothold when descending steep hills, and also serve to lessen the strain on the back tendons. The length of caulkin in such cases must, however, be moderated according to the angle of the fetlock and the inclination of the foot, as if all the strain is removed from the tendons they will contract.

The Shoeing of Hunters.—The shoeing of hunters requires great care and experience, as well as a particular form of shoe. The varied character of the ground over which a horse of this class travels renders it extremely desirable that suitable shoes be applied, and those recommended are concave on the under surface and are fullered with seven nail holes, which should be placed a little nearer the heel than in ordinary cases in order to allow of the natural spring of the foot. The fore shoe must be well tapered at the heels, and in the case of the hind shoe caulkins should be raised on the outer heel, and a corresponding wedge on the inner heel. The hind shoe must not be fullered at the toe, as this may prove dangerous

should the horse overreach. For a hunter with flat foot or drop sole the ordinary fullered shoe, seated out on the foot surface, having the under side hollowed out with a file, and the heels well tapered, is to be recommended.

The Shoeing of Hackney or Carriage Horses.—This class of horse, being used chiefly for road work, requires a broader webb shoe than the hunter, and should also be fitted longer at the heel. Six nail holes will suffice for this class of shoe. Ordinary roadsters should be shod with a plain stamped shoe if under $5\frac{1}{2}$ inches in width. If this dimension is exceeded, however, a fullered shoe must be employed. Should the horse prove a stumbler it will be advisable to roll or "dubb" the toe of the shoe, which must be kept quite short. In the case of a horse forging, an irregularity which might possibly be due to some weakness in the structure of the foot, the use of a concave shoe is to be recommended, and the use of caulkins in cases of this kind is to be condemned, as they tend to aggravate this evil.

Diseases of the Horse's Foot.—The foot is liable to a number of diseases in regard to which it is usually desirable that the advice of a veterinary surgeon should be obtained, but it is necessary that a farrier should have sufficient acquaintance with them to enable him to recognise, and, if necessary, treat them in their early stages. In the courses given by the County Council Instructors these subjects are included, but only two of the more simple affections need be mentioned here.

Corns.—These may be described as a bruised portion of the foot lying between the wall and the angle of the heel (Fig. 2), and may make their appearance in cases where the foot has been badly prepared or the toe left too long. Another cause is the use of badly-fitted shoes, and the animal may go lame. A shoe thinned on the inside heel should be fitted, or if corns are found on both heels, a bar shoe may be used.

Sandcracks.—A sandcrack is a fissure in the wall or crust of the foot, and usually appears on the inside of the fore foot and on the front or toe of the hind foot. In most cases the appearance of these fissures may be attributed to a natural brittleness of the wall, more often than not due to the evil

practice of rasping the crust. Contracted heels and flat or sprawling feet also cause this disease.

In treatment it is well to remember that a division of the horn or wall has taken place, and that the purpose in view is to promote a fresh and rapid growth of new horn from the coronet. With this object the coronet must be sharply blistered, and a day or two afterwards the foot should be immersed in hot water three or four times a day. As far as is possible the blistered skin should be kept free from moisture, and if this treatment is pursued methodically the horse may soon be put to work, being shod with tips in preference to bar shoes.

CO-OPERATIVE SOCIETIES FOR THE PURCHASE OF FARMING REQUISITES.

The purchase of goods in large quantities by an associated group of persons for distribution amongst themselves according to their needs was one of the earliest forms of co-operation in England, and where the goods were sold retail in small quantities, as in the case of the large working class co-operative stores, the advantages of the system were quickly recognised. The application of the principle to the co-operative purchase of farming requisites, on the other hand, has made but slow progress in this country, and farmers generally have, in the past, been disposed to doubt the possibility of obtaining by combined effort any better prices than those which each individual could obtain for himself by bargaining directly with merchants and dealers. There are a few large associations which have a history extending over thirty or forty years, but it is only recently that any considerable advance has been made in the formation of societies for this purpose. There is little doubt, however, that their advantages are now much more generally admitted than was the case some ten or fifteen years ago.

The benefit of co-operative purchase is most obvious in the case of the small farmer who only requires to buy manures, cake, seeds, and implements in small quantities. By purchasing large quantities direct from the manufacturer and selling at cost price, a co-operative society enables the small farmer to procure his goods at a much more moderate rate than he

could by purchasing for himself alone from local dealers. He obtains the benefit of lower rates of carriage, and he is assured of the genuineness of the goods.

Such a society is not only in a position to buy from large merchants or manufacturers, but it can guard itself against adulteration or misdescription by analysis, the cost of which when applied to large consignments is proportionately unimportant, though the trouble and expense involved would tend to discourage the smaller buyer from protecting himself in this way.

Although it is evident that the benefit of such co-operative purchase is very great in the case of the small farmer, there is little doubt that it is equally advantageous to the large farmer, though for a less obvious reason. The quality of manures and feeding stuffs can practically only be tested by analysis, and even then some scientific knowledge is necessary to appreciate the results obtained and the relation between the price charged and the value represented by the analysis. Admitting that many farmers are fully qualified to bargain on equal terms with those engaged in the trade, it is certain that there are many who are not, many more who are indisposed to take the necessary trouble, and many again who are inclined to rely unduly on the description of the goods furnished by the seller. To such, a co-operative society is of the greatest value, for they can depend on their interests being duly safeguarded in every way. They know that they are paying only the wholesale price of an article and they have the further assurance of freedom from adulteration and correct description, because in such a society practically all inducement to overcharge disappears owing to the fact that any advantage taken of a member would only increase the profit which would afterwards be returned to him in the shape of increased dividend or bonus.

These advantages are best secured by a genuinely co-operative association, that is to say, a society in which the capital is subscribed by those interested as consumers, and in which the profits are distributed by paying a fixed rate of interest on the capital, and then dividing the surplus among the members in proportion to the extent to which they have participated in the business. Only members should be admitted

to the advantages of the undertaking, which is carried on for their mutual benefit, and all should have an equal voice in the management. A joint stock company may be run on similar lines, but there is no guarantee that the company may not in time become primarily a profit-making concern for the benefit of shareholders whose connection with its objects may be remote. Some of the older agricultural supply associations, however, which were registered as joint stock companies, have succeeded in retaining their co-operative character, and particulars of the more important associations of this type are given below.

Lincolnshire Farmers' Association.—The pioneer of English institutions of this kind was the Lincolnshire Farmers' Association, which was established in 1868 for the purpose, as stated in its rules, "of purchasing genuine phosphatic manures and of supplying the same to its members at cost prices." Originally it comprised merely a few agriculturists in the neighbourhood of Sleaford, whereas the number of members on the roll in 1907 was 2,523, who were occupiers of 402,000 acres of land in all parts of the kingdom. The method adopted by the Association is to make contracts in advance for the supply of superphosphate of lime and basic slag. Notice of the price is then sent to each member, who is asked to give his order within a reasonable time. Depôts have been established in the different districts, and the manure is supplied carriage paid to the nearest station. Great attention is paid to quality and condition, and numerous samples are taken of the manures supplied. The expenses of carrying on the Association are defrayed by charging an entrance fee of 1*d.* per acre on each member's holding and a registration fee of 1*s.* per ton on the total quantity supplied, the manure itself being invoiced at cost price. Fertilisers, other than phosphate and slag, are also dealt in, but no contracts are made. In 1907 the value of the manure supplied was nearly £13,000. A balance of about £2,200 has been accumulated, and out of this a bonus of £250 was distributed amongst the members in proportion to their purchases during the past two seasons.

Cheshire, Shropshire and North Wales Farmers' Supply Association.—This Association, which was registered as a joint stock company in 1871, was formed for the purpose of

supplying members with manures, feeding stuffs, seeds, and all agricultural requisites, in order, as the prospectus states, "to avoid both the risks of adulteration and impurity, and the increased prices which are inevitable when transactions are carried on by agents and advertising." The capital is limited to £20,000 in £1 shares, and the possession of five shares entitles the holder to the advantages of the Association. At least one-half of the profits is to be returned to purchasing members in proportion to the amount they buy, and not more than 5 per cent. is to be paid on the subscribed capital. The success of the Association is shown by the great increase in the sales during the past twenty years : in 1887 they amounted to £20,000, in 1897 to £33,000, in 1902 to £72,000, and in 1907 to £110,000; the profit in the last-named year was £2,400, and a bonus of 6d. in the £ on members' purchases was paid in addition to interest.

Northumberland Agricultural Supply Association.—This Association, which dates from 1872, is a joint stock company on similar lines to the Cheshire Association. The capital is £5,000, and the sales in 1907 were £14,600. A bonus of 3d. in the £ was paid on the purchases, in addition to 5 per cent. interest.

Western Counties Agricultural Co-operative Association.—This Company was formed in 1879 for the purpose of supplying its shareholders and members with agricultural requirements on advantageous terms for their mutual benefit. Members are admitted at an annual subscription of 5s. The progress of this Association has been very striking :—In 1883 the sales amounted to £68,000, in 1889 to £143,000, in 1898 to £298,000, and in 1907 to £536,000. The business is stated to be conducted on strictly co-operative principles, and all surplus profits are divided annually in proportion to the amount of the purchases; in 1907 the bonus was 4½d. in the £. The capital is £50,000 in £5 shares, and interest thereon is limited to 5 per cent.

The principal offices are at Plymouth, and it has mills for the manufacture of foods and manures at Bristol, Truro, Bideford, Carmarthen, and Guernsey, and also branches at Wadebridge, Exeter, Southampton, and Cardigan.

West Norfolk Farmers' Manure Co.—This Company,

which has its headquarters at King's Lynn, was founded in 1872 by a body of East Anglian farmers, and it is stated in the Company's Annual Circular for 1909 that "the objects they had in view were, in the first place, to determine by field experiments, and with continuous and careful observation, how best they could fertilise their soils and increase their crops. Having acquired this knowledge, they proposed to manufacture in their own factory, and under their own control, the desired articles or compounds."

Capital was raised by the issue of £1 shares, the interest on which is limited to 6 per cent., any profit above that amount being divided among the consuming shareholders in the proportion of two-thirds on the quantity purchased, and one-third on the capital invested in the Company. All the shares have been issued, so that persons can now only become shareholders by purchasing any shares which may be offered for sale by the present holders.

Manures are manufactured in the factory, the quantity sold last year being 32,000 tons, while other kinds, as well as feeding-stuffs and various agricultural requisites, are purchased for sale to customers. Sales are not limited to shareholders. During the last ten years the business of the Company has doubled, and early last year it was resolved to add another factory, and land was bought for the purpose. Action in this direction has, however, been deferred for the present.

An interesting feature of this Company is that it has from its first inception carried out field experiments on the farms of its shareholders or of sympathetic friends. Unfortunately, the results of these experiments have not been made public, though it is stated that they have been "duly noted and recorded." Importance is also attached to the chemical and physical analysis of soils, and during the past five years 1,092 samples of soil have been examined in the Laboratory. It is observed in the Circular above referred to that by continuing this process a knowledge of the requirements of each district is being acquired. Analyses are also made of fertilisers, and advice is given respecting insect and fungus attacks.

Aspatria Agricultural Co-operative Society.—This is

another old-established co-operative society dating from about 1872. It undertakes the purchase of fertilisers, feeding-stuffs, seeds, and other requirements, and it endeavours to guard against adulteration by subjecting the commodities bought to systematic analysis. Its share capital is only £2,063 in £1 shares, and interest at the rate of 5 per cent. is guaranteed to members whose purchases amount to £10. The surplus profits are divided yearly, and it is pointed out in the Report for 1907 that the actual capital invested has been returned to purchasing members in interest and dividends four times over. The actual sales for the year are not given, but it is stated that since the formation of the Society the total sales have amounted to £552,000.

Farmers' Supply Association of Scotland.—This Society, which was founded in 1884, differs from any of the foregoing in that it is registered under the Industrial and Provident Societies Acts. It is strictly co-operative, no sales being made to the outside public, and only persons directly connected with farming are admitted as members. The holding of a single £1 share admits to all the privileges of membership, and there is no limit to the number of members. In 1907 3,932 shares had been subscribed for by 1,305 members. Interest is limited to 5 per cent., but any additional profits may be divided in proportion to the purchases. The business done has steadily increased and the sales amounted to nearly £50,000 in 1907.

In an amendment of the rules of this Society made in 1906, it was provided that agricultural co-operative societies or similar bodies may become members of the Association, and that goods may be supplied to such societies for use on the farms or properties of their members. By this means a small society is able to obtain goods on better terms than it could if purchasing for itself alone, and eight such societies, promoted by the Scottish Agricultural Organisation Society, became members in 1907.

The above are examples of some of the older agricultural societies. In 1901 the Agricultural Organisation Society was established for the purpose of encouraging the application of co-operative principles to agriculture, and since then a number of new societies for the supply of requirements have been

formed. Some of these are quite small local bodies, while others have even within a few years been able to establish a large business.

All these societies are registered under the Industrial and Provident Societies Acts, and only a small proportion of the nominal value of the shares is usually paid up in order not to exclude small holders from participating in the benefits. In several large societies the shares are 5*s.* each, of which only 1*s.* 3*d.* is actually paid. Members are required to take up shares in proportion to the land they hold, such as one share for every ten acres. Interest on the shares is fixed at 5 per cent., and the balance of net profits is devoted to the formation of a reserve fund, and to the payment of a bonus to the workers in proportion to their wages and to the members in proportion to their purchases. There were over 100 societies affiliated to the Agricultural Organisation Society in 1907, and although the majority of them are probably mainly composed of small farmers this is not exclusively the case.

The Eastern Counties Farmers' Co-operative Association, for example, which was incorporated in 1904, had 686 members in 1907 representing an area of 212,500 acres, or an average of over 300 acres per member. This body is probably the largest of the newer co-operative societies, and its sales amounted to £177,000 in 1907 compared with £15,400 in 1904-05. The prices charged were very little above the actual cost of the goods, so that the net profit was only £1,100.

A society representing a large acreage but a small membership is the Cambs, Hunts, and Isle of Ely Farmers' Supply Association, which had 89 members in 1907 representing 67,000 acres, or an average holding of 750 acres. The sales of this Society amounted to £7,800 as compared with £4,400 in the previous year. A more recently formed society, the Midland Farmers' Co-operative Association, which dates from 1906, has 300 members, farming 60,000 acres of land, or an average of 200 acres each. The turnover in the first year amounted to £16,000, and was apparently rapidly increasing.

In the case of societies such as those mentioned above, their aggregate orders are sufficient to enable them to obtain goods from manufacturers at cheap rates, but in the case of smaller societies, though they may succeed in obtaining more favour-

able terms than their individual members would be likely to obtain, the combined orders of any one society may still be relatively small. In order to obviate this difficulty, an effort has been made to unite these societies in a federation known as the Agricultural Co-operative Federation, which by amalgamating their requirements would be in a position to purchase in large quantities. Each society which is affiliated to this federation is required to hold shares of the nominal value of £1, with 1s. paid on each in proportion to the amount of its turnover.

A set of model rules for a co-operative agricultural trading society has been prepared by the Agricultural Organisation Society, and that body is prepared to advise and assist in the formation of such associations.

The society should be registered under the Industrial and Provident Societies Acts, as such societies possess certain advantages over companies registered under the Companies Acts. The fee for registration in the case of a co-operative agricultural society is usually £1.

Swift Moth.—Specimens of peonies, of which a large number had been badly attacked by a caterpillar, were

Notes on Insect,
Fungus and other
Pests.*

received from Surbiton. The pest was identified as the Swift Moth caterpillar (*Hepialus*), and no fewer than eight caterpillars were found in the material

sent for examination. These caterpillars are very voracious, and attack the roots and underground stems of both cultivated plants and weeds. On a small scale they could be combated by the injection of bisulphide of carbon (see Leaflet No. 10), but on large areas soot should be prong hoed into the soil, and they may be combated by similar methods to those applicable in the case of surface caterpillars (Leaflet No. 33). See also *Journal*, September, 1907, p. 352.

Wheat Midge.—During last August the Board were consulted as to the damage caused to barley and wheat in the parish of Begelly (Pembrokeshire) by what was believed to

* Notes dealing with the specimens submitted to the Board for identification will appear in this *Journal* month by month. The notes commenced with the issue for June, 1907.

be the Hessian fly. Subsequently, owing to the doubtful nature of the infestation, Mr. W. P. Jones, of the Loveston Council School, Begelly, examined the infested land, and forwarded specimens to the Board. The larvæ (or pupæ) found were said to be of a bright blood-red colour in August, but when sent to the Board in November as pupæ they were rather lighter in colour. They were identified as the pupæ of one of the wheat midges (*Diplosis aurantiaca*), a species which, like *D. tritici*, is a dangerous pest of wheat, while it also attacks barley and rye. Notes on *D. tritici* and the methods of combating it were given in this *Journal* in September 1907, p. 353, and October, 1907, p. 415, and these may be taken to apply to *D. aurantiaca*. The pest would not attack any crop other than a cereal or grass.

Mealy Bug.—The term "Mealy Bug" is applied to two members of the family *Coccidæ*, viz., *Dactylobius citri* and *D. longispinus* (formerly known as *Coccus adonidum*). These two insects are harmful not only on vines but on other greenhouse plants. The best treatment for destroying these pests consists in fumigation with hydrocyanic acid gas (see Leaflet No. 188).

According to Newstead (*Monograph of the British Coccidæ*, Vol. II.), *D. citri* breeds rapidly in summer, and although the males are not found in winter, all stages of the female occur. This species secretes honey, and this is taken as a food by ants. Where the insect is abundant the honey collects on the leaves of the infested plants and acts as a germinating medium for fungus spores. *D. citri* has been recorded at Kew in the open, "on ivy-clad hothouse walls."

D. longispinus resembles the former species in its mode of life. It is a greenhouse species in temperate climates, but an open-air species in tropical and sub-tropical countries.

Mites in Flour.—A sample of flour from Norwich was found to be infested by *Aleurobius farinæ*, a mite which has a widespread distribution, and may occur in abundance in flour, dried grain, dried vegetable produce generally, and also on cheese. *Aleurobius* lays its eggs in flour, in which it breeds freely. The flour might be fumigated with bisulphide of carbon in the manner described in Leaflets 136 and 150, and the flour would lose any taint on exposure to

the air. The hay mite (*Tyroglyphus longior*), mentioned in this *Journal* for December, 1908, p. 688, may also occur in flour.

False Scorpion, or Chelifer.—A minute creature, about one-sixteenth of an inch in length, found at Finsbury Park adhering by means of its two (comparatively) large claws to the leg of a common house-fly, was identified as a chelifer or false scorpion. The false scorpions belong to the class *Arachnida*, and get their name from a resemblance to the true scorpions, from which they differ, however, in having no sting-bearing tail. They live typically in obscure places, among dead leaves, and decaying plant matter in stables, mills, &c., and in moist places under bark. The commonest species is perhaps *Obiscum musacorum*, but another species, *Chernes nodosus*, has also been taken hanging to a fly. Both are harmless.

Slugs.—The Board were informed in January that some of the fields on a Yorkshire estate had become so infested with grey slugs that at least half the crop in the case of barley and oats was totally destroyed. The slugs also infested some of the grass fields to such an extent that the herbage was materially damaged. Slugs and snails are dealt with in Leaflet No. 132, but in regard to the remedies suggested therein it should be emphasised that where irritant dressings are applied, they should be given at such times as the slugs may be feeding—*i.e.*, early in the morning or late in the evening. Further, one dressing is not sufficient. Where fields are badly infested, as in the case under notice, the use of gas-lime would perhaps be best. The gas-lime should be spread in the autumn, and be allowed to lie for six weeks before ploughing it in. Both adult and young slugs are killed by this treatment.

In connection with the Order prohibiting the importation of foreign hay and straw, the Board of Agriculture and

Fisheries caused an inquiry to be made

**Production of
Hand-thrashed Rye
Straw in France.** last year into the conditions under which hand-thrashed and combed rye straw is produced in the North of France.

It appears that in certain parts of the North of France in

the Departments of the Pas de Calais and the Nord, a considerable portion of the cereal crops is thrashed by hand because the small producers have not sufficient material for a thrashing machine, and also because it is cheaper to employ hand labour, which is available throughout the winter. The principal reason, however, is because the straw which is thrashed by hand is a very much more remunerative article than if it is machine-thrashed. This applies particularly to rye straw, and to such an extent that many large farmers who could easily hire, or even own, a thrashing machine, frequently have all their rye thrashed by hand. The rye in question grows luxuriantly under the favourable conditions prevailing in this district, and has a very strong stem, which frequently exceeds five feet in length. Wheat and oat straw is also produced and prepared under the same conditions as rye straw, but because of its shorter length does not pay so well.

The straw is placed on the local market in various forms. It may be (1) machine-thrashed, or (2) hand-thrashed; and hand-thrashed straw may be (a) combed, (b) uncombed, (c) pressed into bales with the thin end of the sheaves turned in, (d) straight pressed, *i.e.*, entirely unbroken, or (e) manufactured in various forms, *e.g.*, stitched into mats, &c.

The straw is combed in a very simple way, frequently merely with the hand, or with a very short-handled wooden rake, which is passed several times through the butt end of the sheaf; or the sheaf may be taken by both hands and pulled several times through a row of wooden prongs which, pointing upwards, are firmly fixed to a trestle about four feet in height. The same result is obtained by each method, *i.e.*, the loose sheaths or leaves which surround the stem are removed, as well as the weeds, &c., which were cut and bound with the sheaf.

The importation of hand-thrashed rye straw into Great Britain is permitted by special licence in each case, subject to the condition, among others, that the straw shall be kept separate from any live stock, and only be used for thatching houses or buildings, or for saddlery purposes.

At a recent meeting of the Royal Dublin Society, Dr. Woltereck read a paper on the production of ammonia from atmospheric nitrogen by means of peat,

Production of Sulphate of Ammonia from Peat. and gave a description of his experiments, which, he believes, will enable

sulphate of ammonia and other products to be produced from peat on a commercial scale. Large works have been laid down with this object at Carnlough, in Ireland, and the preliminary workings have given promise of satisfactory results. The Woltereck process consists in passing a mixture of air and water vapour over peat kept at a low grade of heat in specially devised furnaces, and it has been proved that in its commercial work a yield of 5 per cent. of sulphate of ammonia on actual dry peat may be obtained, and besides this main product, acetic acid and paraffin tar are recovered, while the ash of the peat is saleable as a cheap fertiliser, as it contains potash, lime, and phosphoric acid in an available form. The sole rights have been acquired for a period of 40 years to cut peat over an area of 3,000 acres at Carnlough.

The Board have received a copy of Government Notice No. 21, dated January 20th, 1909, issued by the Government of Malta, which prohibits the importation

Importation of Potatoes into Malta. of potatoes exported from England or Scotland, unless accompanied by the following documents, viz.:—(1) A

Statutory Declaration by the shipper, naming the place of origin, and stating that such potatoes were not grown on land infected with black scab; (2) a certificate from an officer of the Board of Agriculture and Fisheries stating that the locality in which the potatoes were grown is free from that disease.

Consignments of potatoes not accompanied by the documents above mentioned shall, on importation, be liable to be inspected, at the expense of the consignee, by the Inspector of Agriculture, who may give such directions and take such steps as he may consider necessary.

The Board of Trade have received information from H.M. Trade Commissioner in South Africa that Regulations have been issued under the provisions of

Importation of Potatoes into Natal. Proclamation No. 119 of 1906 and Government Notice 449 of 1906, notifying that, from April 1st next, consignments of potatoes showing any trace of the diseases "white rot," "scab," "black rot," "gall worm," and "potato tuber moth" will not be permitted to enter Natal.

It is further stated that agents importing potatoes for the inland Colonies are warned that consignments railed from Durban and subsequently condemned across the border will not be allowed to re-enter the Colony, except for shipment abroad.

A Report on the Agriculture of Southern Italy by the late Mr. Consul-General E. Neville-Rolfe (Foreign Office,

Miscellaneous Series, No. 673) gives

Demand for Live Stock in Italy. an interesting account of the principal crops grown in the district, as well as of the breeding of live stock. In regard to the latter point, a good deal of useful information is given as to the types and principal breeds, methods of feeding, &c., and in conclusion Mr. Rolfe states that British breeders ought to find a ready sale for live stock in Italy. "It is obvious," he goes on to say, "that live stock cannot be sent from the United Kingdom or anywhere else on speculation, and that were this attempted, loss would most certainly follow. It is therefore essential that foreign buyers should come to us, see what we have, buy what they require, and take it away with them. There is absolutely no other way. Here, then, is the primary use of our horse and cattle shows. These show the foreigner what we have, and they show it at its very best."

"*Horses.*—Italy is a very good customer for horses, many excellent half-bred stallions being imported annually from the United Kingdom. A large import of hunters for use as chargers also takes place both from England and Ireland. Full-sized carriage horses also come over in goodly numbers.

These are nearly all geldings, mares being unsuitable in a country where so many working horses are entire.

Cattle.—Cattle breeding is on a different footing. Even on the large estates of the nobility, cattle are not bred in any great numbers, and anyone wanting to buy, say, 500 head of neat stock, would have to go from farm to farm buying five or six beasts at a time. A herd of pedigree cattle would be an absolutely new departure, even in the case of local breeds, which one would expect to be kept more or less distinct. No Italian cattle breeder is likely to start a herd of shorthorns or Herefords or Scotch cattle, though in some parts of the country the last-named would seem especially adapted to his requirements. The expense and risk of importing pedigree stock would be quite prohibitive. Dealers will only buy what they are accustomed to buy and fight shy of novelties.

Sheep.—Sheep are on a different footing. Rams are much more easily imported, and their influence in a flock is much more sensible than that of a single bull in a herd of half-bred cows. Italian breeders might wisely buy Lincolns or obtain Merino rams from such of our Colonies as are in direct communication with Italy, notably from Australia, whither there are direct steamers every few days. The milking of sheep has been so long discontinued in the United Kingdom that it is questionable if we have any breeds which we could confidently recommend as 'milkers.'

Goats.—Much might be done in improving the goats. Greater size and quality might be obtained. The difficulty in the way of this is that goats are rarely seen in the important cattle shows in the United Kingdom which alone are visited by foreign buyers, and also the owners of flocks of goats in Italy are chiefly poor peasants with no money and less initiative. Another fact which will lead before long to the reduction of the number of goats is that they will certainly be excluded from the streets of the towns before very many years are past, and then the sale of their milk will decline to vanishing point.

Donkeys.—We are more likely to buy donkeys of Italy than she of us. On visiting a donkey stud farm in the United Kingdom anyone who knows what a donkey can be

will be surprised at the lack of quality in the British jackass (or donkey stallion). In this respect Egypt is superior to Italy, and the Egyptian Agricultural Department is breeding animals that might with great advantage be imported into the United Kingdom. The difficulty is that with us the donkey is the poor man's quadruped, and he expects to be supplied with a useful beast at from £3 to £5. A choice beast cannot be produced at that price. In two cases known to the writer, country gentlemen imported Egyptian 'jacks' to the great advantage of the working men of their districts. This might be done oftener at an insignificant cost to the landowner. The animal can do garden and railway station work for the mansion and be used for stud purposes when required. Such an animal can be bought in Egypt for £20 at three years old, and his transport to the United Kingdom may cost some £5 more."

Few points are of more importance in the feeding of live stock than the question how far one food may be substituted

Experiments in the Feeding of Live Stock. for another without materially affecting the quality of the ration. Knowledge on this point enables a farmer to adjust his feeding to fluctuations in the price of purchased foods, and to make the

best use of home-grown foods. An example is mentioned in a recent Report by Prof. Gilchrist, where it is pointed out that in November, 1903, the price of maize and of hay was the same, viz., £5 a ton, while in October, 1908, maize was £7 a ton and hay less than £4 a ton. Assuming, therefore, that 3 lb. maize meal contain practically the same feeding constituents as 5 lb. meadow hay, it would have been profitable in 1903 to sell hay from the farm and buy maize, whereas at the prices prevailing in 1908 the reverse would be the case.

This report* gives the result of some trials in which the equivalent feeding value of different foods, as shown by the published tables of the composition and digestible consti-

* County of Northumberland, Agricultural Experiment Station, Cockle Park, Bull. 12.—Feeding Experiments with cattle and sheep, 1904-8.

tuents, was tested by actual experiment. In the first series, the point raised was the extent to which swedes can be replaced, in the event of a scarcity of roots, by dry food, such as maize meal or meadow hay; while another lot of experiments has been directed to the comparison of the feeding value of different kinds of cake.

Substitutes for Swedes—In 1901 an experiment in feeding yearling cattle was carried out, in which one lot of eight beasts received 56 lb. swedes, 4—6 lb. cake and meal, and 7½ lb. hay, while another lot received cake, meal, and hay in similar quantities, but only 28 lb. swedes, the place of the remainder being supplied by 3 lb. clover hay, ½ lb. maize meal, and ½ lb. treacle. The feeding results in this case were practically equal, but the substituted foods were slightly more expensive than the swedes. Another experiment on the same lines was conducted in 1901–2, but in this case Lot I. received 28 lb. swedes, 4½—6½ lb. cake and meal, ½ lb. treacle, and 11½ lb. meadow hay; while Lot II. received no swedes, but 2½ lb. clover hay, ½ lb. maize meal, and ½ lb. treacle instead, the other food remaining the same. Lot II., however, did not do quite so well as Lot I., and the results showed that it is not advisable to dispense altogether with swedes for the feeding of fattening cattle. The experiments taken together indicated, however, that when there is a scarcity of roots, these may be partly dispensed with, without affecting the feeding results; at the same time, with average market conditions, the foods substituted for the roots are likely to be more costly than the roots themselves.

In 1907–8, experiments with the same object were undertaken with twelve cattle under two years old. Lot I. received 56 lb. swedes, 14 lb. meadow hay, and 3—5 lb. cake and meal, while Lot II. received 28 lb. swedes only, with 2½ lb. meadow hay, and 2 lb. maize in place of the balance of the swedes, and hay, cake, and meal as in the case of Lot I. The substituted foods were slightly richer than the swedes, and gave slightly better results, though as the cost was higher the net result of the two lots was practically the same. The hay was given in its long condition, and the meal as dry meal.

In another case eighteen calves just over six months old

were divided into two lots, and received $8\frac{1}{2}$ lb. meadow hay and $1\frac{1}{2}$ lb. cake and meal, while Lot I. got 21 lb. swedes in addition, and Lot II. 2 lb. maize and 1 lb. meadow hay in place of the swedes. In this case Lot I. did somewhat better than Lot II., and the experiments confirm the previous conclusion that while half of the roots of the ration can be replaced by concentrated foods, it is not advisable to replace the roots in the ration altogether, if a small quantity of roots is available. At the same time they showed that young cattle can be quite successfully brought through their first winter without the aid of roots.

Comparative Feeding Values of Different Cakes.—Feeding experiments with cattle, carried out in the winters of 1905–6 and 1906–7, dealt with the comparative feeding values of Indian cotton cake, decorticated cotton cake, and linseed cake. Professor Gilchrist considers that these have resulted in showing that the following quantities represent practically equivalent feeding values :—(1) 3 lb. decorticated cotton cake; (2) $3\frac{1}{8}$ lb. Indian cotton cake and 1 lb. decorticated cotton cake; (3) $3\frac{1}{8}$ lb. Indian cotton cake and 1 lb. linseed cake; (4) $3\frac{1}{10}$ lb. linseed cake. Five lb. Indian cotton cake are also considered as practically equal in feeding value to a mixture of 2 lb. decorticated cotton cake and 1 lb. linseed cake, but the experiments suggest a balance in favour of the Indian cake. This cake can, when of good quality, be fed advantageously to young cattle just over six months old, in a ration for their first winter's store feeding.

This report also gives the results of experiments with sheep in the winter of 1904–5, which confirm previous experiments in showing that a good average sample of Egyptian cotton cake has given practically the same feeding results as a good average sample of Indian cotton cake. They also indicate that 5 lb. of undecorticated cotton cake are practically equal in feeding value to either 3 lb. of decorticated cotton cake or 3 lb. of linseed cake.

Feeding experiments with cattle were also carried out in the winter of 1904–5, dealing with the relative feeding values of decorticated cotton cake, earth nut cake, sesame cake, and niger cake. The best result was given by decorticated cotton cake, while earth nut cake and sesame cake gave poorer

results than their composition would indicate. This is explained by the fact that these cakes contained considerable amounts of sand, which undoubtedly lowered their feeding value, and Professor Gilchrist suggests that about $3\frac{1}{4}$ lb. earth nut cake and about 4 lb. of either sesame cake or niger cake would practically have the same feeding value as 3 lb. of decorticated cotton cake.

As a result to some extent of these experiments and the calculation of feeding equivalents, Professor Gilchrist gives the following specimen rations for fattening cattle and milking cows, which may be compared with the rations given in the Board's Leaflet No. 79 (Rations for Farm Stock).

Daily Feeding Rations for Fattening Cattle per 1,000 lb. Live Weight (practically 9 cwt.)

1.	2.	3.	4.
66 lb. swedes (or 88 lb. yellow turnips)	33 lb. swedes (or 44 lb. yellow turnips)	66 lb. swedes (or 88 lb. yellow turnips)	66 lb. swedes (or 88 lb. yellow turnips)
2 lb. undec. cotton cake	2½ lb. maize meal*	2 lb. undec. cotton cake	4½ lb. dec. cotton cake
3 lb. dec. cotton cake	4 lb. oat straw*	3 lb. dec. cotton cake	2½ lb. undec. cot- ton cake
4 lb. maize meal	2 lb. undec. cotton cake	1 lb. maize meal	1 lb. maize meal
12 lb. meadow hay	3 lb. dec. cotton cake	17 lb. meadow hay	17 lb. oat straw
	4 lb. maize meal		
	12 lb. meadow hay		

* As substitute for half roots.

It may be advantageous to improve the ration slightly in the last week or two of the feeding period.

Daily Feeding Rations for Milch Cows.—The following rations for milch cows are calculated per 10 cwt. and not per 1,000 lb. live weight, as it is probable that 10 cwt. is about the average live weight of good milch cows in the North of England. For cows of a greater or less weight than 10 cwt. the feeding rations should be increased or decreased in direct proportion to their weights, provided the quantity of milk given is also greater or less in the same proportion.

No. 1.—*Ration for cows giving 18½ lb. of milk (roughly 1½ gallons) per day.*

Quantities for cows 9 cwt. live weight and giving 16½ lb. of milk daily are given within brackets.

39 lb. swedes or 52 lb. yellow turnips (35 lb. or 47 lb.)

19 lb. oat straw (17 lb.)

4½ lb. decorticated cotton cake (4½ lb.)

Roughly speaking 1 lb. less of decorticated cotton cake might be given if the yield is 12½ lb. of milk daily instead of 18½ lb. daily.

No. 2.—*Ration for cows giving 30½ lb. of milk (roughly 3 gallons) per day.*

Quantities for cows 9 cwt. live weight and giving 27½ lb. of milk daily are given within brackets.

46½ lb. swedes or 62 lb. yellow turnips (42 lb. or 56 lb.)

19 lb. oat straw (17 lb.)

6½ lb. decorticated cotton cake (6 lb.)

4½ lb. undecorticated cotton cake (4 lb.)

No. 3.—*As for No. 2, with hay instead of oat straw.*

Quantities for cows 9 cwt. live weight and giving 27½ lb. of milk daily are given within brackets.

46½ lb. swedes or 62 lb. yellow turnips (42 lb. or 56 lb.)

19 lb. meadow hay (17 lb.)

5 lb. decorticated cotton cake (4½ lb.)

3½ lb. Indian cotton cake (3½ lb.)

Heavy milkers, giving about 4 gallons of milk daily, should have all the foods of the best quality possible, and might be given either of the following additions to Ration No. 3 :—

2 lb. seeds hay.

2 lb. linseed cake.

1 lb. maize meal.

} or { 2 lb. linseed cake.
2½ lb. maize meal.

Ration No. 1 might also have hay substituted for oat straw, and if so the decorticated cotton cake could be reduced by about 2 lb. daily. This, however, is not quite an exact equivalent. In any of these rations the roots can be considerably reduced if desired and a substitute used.

Cows giving reduced quantities of milk as the lactation period progresses should have the concentrated food given to them reduced, but cows that are heavy milkers and have become reduced in condition, owing to their heavy milk yields, must not have the food reduced too quickly, but must be allowed to regain condition before coming to the next calving. When cows are to be fattened off at the close of

their milking periods, the ration should not be reduced as indicated above, but should be gradually altered as the flow of milk decreases to that suitable for fattening animals. Cows of 10 cwt. live weight, dried off previous to calving, would probably do well with either of the following rations. (Quantities for cows of 9 cwt. live weight are given within brackets.)

No. 1.—39 lb. swedes or 52 lb. yellow turnips (35 lb. or 47 lb.)

19 lb. oat straw (17 lb.)

2½ lb. maize meal (2½ lb.)

2½ lb. decorticated cotton cake (2½ lb.)

No. 2.—39 lb. swedes or 52 lb. yellow turnips (35 lb. or 47 lb.)

19 lb. meadow hay (17 lb.)

2½ lb. maize meal (2 lb.)

¾ lb. decorticated cotton cake (½ lb.)

The total quantity of fresh milk, cream, and preserved milk imported into the United Kingdom from abroad was higher in 1908 than in any year since 1903.

Imports of Fresh Milk and Cream. This was due to an extension in the imports of cream and preserved milk, the receipts of fresh milk, as will be seen from the following table, being unimportant.

	Fresh Milk.		Cream.		Preserved Milk.		
	Cwt.	£	Cwt.	£	Cwt.	£	
1904	866	394	6,339	25,377	5,706	3,666
1905	238	104	4,996	19,933	3,308	3,782
1906	974	412	4,591	18,066	6,714	4,562
1907	156	68	4,231	16,290	6,975	6,050
1908	953	437	6,862	26,556	8,206	6,446

Fresh Milk.—The whole of the fresh milk imported came from France in the first three months of 1908, and it is stated that the demand for fresh and separated milk at this time was caused by a short supply in England. In 1906 the imports took place chiefly in August, September, and October, and in 1904 chiefly in January, February, and March. The fresh milk appears to be taken by one firm only. The average value was about 9s. 2d. per cwt.

Cream.—The demand for cream is a good deal more permanent than for milk, and is largely independent of season. The largest quantity in any one month, viz., 913 cwt., was received in July, but the quantity in January was not very much less. The bulk of the consignments came from France (£4,839 cwt.), but Norway (1,345 cwt.) and

Holland (498 cwt.) participated in the trade, and small lots were also received from Belgium, Germany, and Denmark, as well as 113 cwt. from Argentina. The quality of the imports, so far as can be judged by the declared value, varies a good deal, cream from France being returned at 84s. per cwt., from Norway at 68s., and from Holland at 57s. per cwt.

It will be seen from the table given above that there was a considerable expansion in the trade during the past year. All the exporting countries shared in this to some extent, but the main increase came from France, which added to her exports by just over 2,000 cwt.

Preserved Milk (other than Separated or Condensed).—The imports of this class were about the same in 1908 as in 1907, viz., 4,477 cwt. as against 4,258 cwt. Holland, Norway, and Belgium are the three countries mainly concerned, but in 1908 three-fourths of the total receipts came from Holland alone. Germany, France, Italy, and Russia also sent small quantities. The average value was 25s. per cwt.

Separated Milk (other than Condensed).—The importation of milk of this type was confined to France, which sent 3,729 cwt. valued at £806, as compared with 2,717 cwt. valued at £620 in 1907. As in the case of fresh milk, the imports chiefly took place in the first three months of the year.

The Ninth Report of the Woburn Experimental Fruit Farm by the Duke of Bedford, K.G., and Mr. Spencer U.

Pickering, deals with the methods of

**Planting of Fruit
Trees.** planting which have now for a number of years been the subject of investigation at Woburn. It is pointed out that

the question whether the accepted methods of planting were really the best was first raised by the circumstance that a plot of apple trees, which was planted in violation of the accepted canons of "good practice," in order to obtain some measure of the importance of careful planting and to afford an object-lesson of the evils of bad planting, did rather better than other plots properly planted. In consequence of this the matter was further investigated, and the present Report gives

an account of several hundreds of trials made with over 2,000 trees in seventeen different localities and in eight different counties.

Method of Planting.—The conclusion arrived at is that the precautions usually insisted upon of not bending the roots, of carefully avoiding all injury to them, of spreading them out—especially the fibrous roots—and of trimming any roots which have been damaged, may all be neglected without detriment to the tree, and, indeed, with some benefit.

The fact that careless planting has little or no effect on the subsequent growth depends on the fact that when a tree is lifted for transplanting, all the delicate tips of the roots, on which growth depends, are broken off, and, as these cannot be re-formed, the existence of the tree can only be continued by its forming new, or adventitious, roots from various parts of the older roots and stems, where there are cells specially modified for the purpose. If the tree is not too old, the adventitious roots which are formed develop most strongly from those parts of the old roots which are thickest, for the store of reserve material on which their development depends is greater in these regions. This reserve material also accumulates at the cut end of a thick root, and generally causes a multitude of adventitious roots to be formed near the cut surface; but this is often not the case with long straggly roots, for these may be situated so far from the body of the tree that the material formed by the leaves has not extended to it sufficiently to accumulate reserve material there.

The whole object to be sought in planting a tree is to secure the formation of fresh rootlets from the main roots, and not to preserve the fibrous roots, which, having lost their root-tips, are little better than dead encumbrances.

Ramming the Soil.—The closer the contact of the soil with the roots of a transplanted tree, the more readily will these adventitious roots be formed; indeed, a tree cannot be planted too firmly in the ground, and it should be thoroughly rammed into the soil; so long as the ground is not too dry, the condition of the soil at the time will be immaterial. It is pointed out in the Report that the correctness of this view has been established by experiments with many hundreds of

trees planted by many different people in various soils and under various conditions. The general results show that when ramming is adopted, the new wood formed by the tree in the first year after planting is about 40 per cent. more than when planted in the orthodox manner, and that this superiority becomes further increased in the second year. The actual shoots, too, are thicker in the case of the rammed trees; and the excess of branch formation is accompanied by, and is, no doubt, the consequence of, a similar excess of root formation. During the first part of the season after planting, however, there is no excess of branch-formation, often the reverse, this period of inferiority being due to the drain caused on the store of reserve material in the tree by the increased number of new rootlets which are being formed. It is not till after these have come into existence that they can affect the growth of the branches, and in some cases their effect may not be felt till the second season after planting.

The result of ramming will naturally depend somewhat on the nature of the soil, and where it is very light and sandy it can have little or no effect.

Deep Planting.—Roots require air as well as water for their well-being, and with each sort of tree, and with each class of soil, there is a certain depth below the surface which is most favourable for root-growth. Experiments to test this were made by planting stocks at different depths in the soil, when it was found that in the case of the deeply planted ones, the original roots did not develop, or actually died off. In the case of paradise stocks, where adventitious roots are easily formed, this deep planting resulted in benefit to the tree, though the results were found to depend to a large extent on the nature of the soil. With stocks that do not easily throw out adventitious roots, the reverse would be the case.

Trenching.—The experiments as regards trenching are at present considered to be inconclusive. The Report, however, suggests that deep cultivation will probably benefit trees only in cases where it materially improves the drainage, and where the subsoil is sufficiently rich to form a suitable medium for root-development. In other cases it is better to confine the roots as far as is possible to the surface.

Planting Above the Ground Level.—With a shallow soil

resting on a stiff subsoil, high planting is probably of more use than trenching. Experiments made with a number of apples at Ridgmont gave an excess of 20 per cent. in growth during the first season as the result of such surface planting, but in the succeeding season, which was exceptionally dry, these trees did not do so well as others planted on the level.

Date of Planting.—Planting trees early in the autumn has been found to be advantageous, though the difference due to planting at any particular time later on in the dormant season was quite inappreciable.

Arrangement of Trees.—Some experiments were conducted to ascertain the respective merits of planting the same number of trees in a given area when arranged on the hexagonal and square systems, and also on a rectangular arrangement. No very substantial differences could be ascertained, and it is considered that growers can adopt the square arrangement, which affords better facilities for cultivation, without any appreciable sacrifice of the welfare of the tree.

The selection of the best and most suitable varieties of fruit trees is of the first importance in planting, and a few of the more useful varieties are mentioned in the Board's Leaflet No. 148

(Planting Fruit Trees and Bushes) and Leaflet No. 134 (*Apple Culture*). A selected list of dessert and cooking varieties of apples suitable for planting in different parts of the country was also given in this *Journal* in April last (p. 52).

The varieties of pears mentioned in the leaflet are not, however, very numerous, so that it may be useful to reproduce a selection given in the *Journal of Horticulture* (October 22, 1908). This list represents the opinions of some sixty fruit growers, who were asked to select the eighteen choicest dessert varieties of pears for garden cultivation, capable of furnishing a supply from August to April, as well as the twelve most reliable varieties for orchard cultivation.

The following list shows the garden dessert pears chosen, arranged in order of popularity; thus *Doyenné du Comice* was mentioned by every grower, *Louise Bonne de Jersey* by 57 growers, out of a total of 60; *Williams' Bon Chrétien* by 56, while the last five received only 21 votes each.

Position.	Variety.			Season of Usefulness.
1	Doyenné du Comice	...	.	Nov. into Dec.
2	Louise Bonne de Jersey	...	.	Oct.
3	Williams' Bon Chrétien	...	.	Sept.
4	Marie Louise	...	.	Oct. and Nov.
5	Josephine de Malines	...	.	Jan. to March.
6	Jargonelle	...	.	Aug. into Sept.
7	Winter Nelis	...	.	Nov. to March.
8	Thompson	...	.	Sept. and Oct.
9	Glou Morceau	...	.	Nov. and Dec.
10	Beurré Superfin	...	.	Oct. and Nov.
11	Emile d'Heyst	...	.	Late Oct. and Nov.
12	Pitmaston Duchess	...	.	Oct.
13	Beurré Hardy	...	.	Oct.
14	Easter Beurré	...	.	Dec. to March.
15	Durondeau	...	.	Oct.
16	Beurré Rance	...	.	Feb. to April.
16	Marguerite Marillat	...	.	Early Oct.
17	Fondante d'Automne	...	.	End Sept. and Oct.
18	Beurré Diel	...	.	End Oct. and Nov.
18	Conference	...	.	Oct.
18	Olivier de Serres	...	.	Jan. to March.
18	Triomphe de Vienne	...	.	Sept. and Oct.
18	Beurré d'Amanlis	...	.	Sept.

Twelve other varieties received from ten to twenty votes, these being Souvenir du Congrès, Clapp's Favourite, Le Lectier, Bergamotte Esperen, Doyenné d'Eté, Nouville Fulvie, President Barabé, Charles Ernest, Beurré Giffard, Knight's Monarch, Ne Plus Meuris, and Marie Benoist.

Only 44 growers gave their opinions as regards orchard pears, and here Williams' Bon Chrétien was distinctly the favourite, being selected by every grower, while Louise Bonne de Jersey received 33 votes.

Position.	Variety.			Season of Usefulness.
1	Williams' Bon Chrétien	...	.	Sept.
2	Louise Bonne de Jersey	...	.	Sept.
3	Beurré d'Amanlis	...	.	Oct.
4	Emile d'Heyst	...	.	Late Oct. and Nov.
5	Pitmaston Duchess	...	.	Oct.
6	Hessle	...	.	End Sept. and Oct.
6	Marie Louise	...	.	Oct. and Nov.
7	Jargonelle	...	.	Aug. into Sept.
8	Beurré Capiaumont	...	.	Oct.
9	Fertility	...	.	Mid-Sept. into Oct.
10	Doyenné du Comice	...	.	Nov. in' o Dec.
11	Beurré Clairgeau	...	.	Oct.
11	Beurré Hardy	...	.	Oct.
12	Durondeau	...	.	Oct.
12	Josephine de Malines	...	.	Jan. to March.

In addition, Clapp's Favourite, Conference, Thompson, Catillac (culinary), and Beurré Diel were mentioned by ten or twelve growers.

The following varieties occurred in both lists:—Beurré d'Amanlis, Beurré Hardy, Doyenné du Comice, Durondeau, Emile d'Heyst, Jargonelle, Josephine de Malines, Louise Bonne of Jersey, Marie Louise, Pitmaston Duchess, Williams' Bon Chrétien.

The Board of Agriculture and Fisheries have received through the Foreign Office a memorandum, of which a summary is given below, furnishing certain information as to the planting of waste lands in Germany. Some particulars as regards the steps taken in Denmark, Holland, France, and Belgium appeared in the *Journal* for February last, p. 858.

Prussia.—During the six years 1901–1906 about 300,000 acres of land suitable for forestry were acquired by purchase or exchange, of which a part was already wooded. The cost of purchase, including about 57,000 acres of agricultural land, as well as a number of dwelling houses and farm buildings, which were taken over at the same time, amounted altogether to £1,934,000. The cost of afforestation amounts on the average to about 48s. per acre.

The Scots fir (*Pinus sylvestris*) is almost entirely employed on the diluvial sandy soils of the North German plain; where the nature of the soil is suitable, seed is used, but in most cases yearling plants are employed. Uncultivated tracts in the hilly and mountainous country of West Prussia are planted with four or five year old transplanted saplings of *Pinus excelsa*.

As regards measures for encouraging afforestation among rural communes and private landowners, it is stated that expert instruction and advice are given to landowners, the efforts of societies for sylviculture are stimulated, seedlings and plants are provided cheaply or free of charge, and grants and prizes for afforestation are made. In 1908, an outlay of £22,500 was provided for in the Budget for the purpose of encouraging communal and private action, and the formation of forestry sections in the Chambers of Agriculture has done much towards the promotion of private enterprise.

Bavaria.—No provision is made for the acquisition or planting of waste and poor heath land, as such land is usually in the possession of communal or private owners. Should an exceptional case arise, however, ample funds are available for the purpose. There are no legal regulations by which private proprietors or communities can be constrained to

plant waste lands, which have not hitherto been within the forest area, but the management of this latter area is defined by law and by regulations made thereunder. The Royal Forest Authorities must support by their advice and help efforts towards the afforestation of waste grounds; assistance and encouragement are given towards the afforestation of such land, as well as towards the planting of fruit trees, and the carrying out of such undertakings is rendered easy by means of loans at a low rate of interest. In addition, non-refundable subsidies are granted to communes for the laying out of new plantations, from the State fund provided for agricultural purposes in general.

Saxony.—No waste lands of any extent exist in the Kingdom, but a fund, formed by the sale of State property, is devoted to the acquisition of unproductive land in the neighbourhood of the State forests, in order that such land may be reclaimed by methodical planting.

The State, however, actively supports efforts on the part of communes and private persons who possess wooded areas, both by giving advice and by providing plants at cost price. Working plans are also drawn up for such owners by the *Forsteinrichtungsanstalt*. Instruction is also given at the Tharandt School of Forestry.

The District Agricultural Societies also encourage private enterprise by lectures, and by the grant of subsidies to owners for the planting of deforested areas and the planting of bare pieces of land unsuitable for agriculture.

Württemberg.—No special steps are taken by the State towards the planting of waste lands. In accordance with the law, an area, which in the opinion of the Forest Authorities is suited to timber growing, but which becomes deforested, must be replanted within a certain time. In each forest district, private forest land is inspected every five years in order to secure the carrying out of these and other regulations. The Head Forester, therefore, in each district has ample opportunities to stimulate the afforestation of land suitable for planting, and to give owners the benefit of his advice on all forestry matters. Saplings from the State nurseries are supplied at a small cost, instruction is given at the Agricul-

tural Institute at Hohenheim, and in exceptional instances, such as the planting of rocky slopes, subsidies are granted towards the preliminary expenses.

It may be mentioned that in accordance with the property tax law in Baden, all private waste lands, pastures, fields, and uplands, planted with timber, remain free from taxation for a period of twenty years, counting from the beginning of the first year of planting.

In June, 1908, the President of the United States appointed a Commission to inquire into and advise as to the condition

of the natural resources of the country
Conservation of with a view to the prevention of the
Natural Resources in wasteful exploitation of timber and
the United States. minerals, and for the proper develop-
ment of water power and waterways,

as well as of public lands. The Commission is composed of a representative body of men, and the co-operation of the State authorities has been enlisted.

The first steps taken have been directed to the compilation of a statement in regard to the resources of the country based on information in the possession of the various Government Departments or derived from other authoritative sources, and the following are among the points to be included in this statement :—(1) Changes desirable in the public land laws in order to promote the best permanent use of the land; (2) means of increasing agricultural production and preventing loss; (3) utilisation of public grazing lands; (4) reclamation of marsh lands; (5) development of irrigation; (6) use of inland waterways; (7) development of water power; (8) control of floods; (9) extent of forests, production of timber, exhaustion of supply, best means of increasing productiveness of forests; (10) supply of minerals and duration of existing resources; (11) conservation of life and property in mining and by the prevention of fires; (12) losses of live stock by diseases, &c.; (13) condition of fisheries and supply of game.

The month of February was marked by an unusual absence of rain during the greater part of the four weeks. During the *first* week, indeed, the rainfall exceeded the normal in Scotland and the northern

Notes on the Weather in February. districts of England, but over the greater part of England it was very slight. The temperature was above the average, although the amount of bright

sunshine differed little from what is usual at this time of year. During the *second* week the rainfall was less than the normal in all parts of Great Britain, but in most places the deficiency was slight. Bright sunshine was in excess in the south (England S.E. "abundant," S.W. "very abundant"), but in the north it was otherwise (Midlands "scanty," England N.E. "very scanty"). The temperature was below normal on the whole, and snow fell in places. In the *third* week the weather throughout Great Britain was, as a whole, exceedingly fine and bright. Rainfall was less than the average in all districts, and at many stations in central England and elsewhere the week was rainless. Warmth was "deficient" throughout England, but sunshine was "abundant" or "very abundant" in each district of Great Britain.

During the *fourth* week the sunshine was again above the average, though the warmth was for the most part "deficient." Rainfall was below the average again, and a marked deficiency was recorded nearly everywhere throughout the United Kingdom. Rainy days had been fewer in Great Britain and the actual rainfall less everywhere. In England S.W. the total fall for the winter was nearly $4\frac{1}{2}$ inches less than usual, and in several other places it was more than 2 inches short. At the same time the accumulated day degrees above 42° were deficient, while in several parts of England more degrees below 42° were recorded.

The reports received from the Board's correspondents all speak of the drought. From Kent it is stated that on the whole the weather was excellent for farm work till the snow came. Ploughing well forward; some barley, peas, and beans sown, but now stopped. The weather was good for the lambs till the frost came. Reports as to the fruit farms are good; fruit buds are plentiful and well kept back. Vegetables have suffered. In Berkshire it is said that the weather has not been bad for outdoor work, which is now in a favourable position. Lambing apparently very successful. No sowing done as yet in the locality of the writer. Green stuff looking bad from frost.

France.—The official report on the winter-sown crops was published in the *Journal Officiel* for February 7th. The figures showing the area of

Notes on Crop Prospects Abroad. wheat, mixed corn, rye, oats, and barley, together with an indication of their condition in January, are given separately for each Department. The

total area under wheat is given as 15,932,000 acres, or an increase of 476,000 acres compared with the estimated area returned as sown in January, 1908. The other crops also show increases in each case. The condition is generally stated to be "good," but "very good" is recorded for a few Departments.

Australia.—Dornbusch's Evening List (March 1st) publishes estimated figures showing how the wheat crop for 1908 compares with that of the previous year:—

	1908 Bushels.	1907 Bushels.
New South Wales ...	15,731,000	9,156,000
Victoria ...	24,164,000	12,100,000
South Australia ...	19,980,000	19,098,000
West Australia ...	2,854,000	2,926,000
Queensland and Tasmania	1,750,000	1,700,000

Argentina.—A telegram from Buenos Aires, dated March 1st, states that although no fresh official crop statement has been issued, Señor Lahitte, Chief of the Statistical Department of the Department of Agriculture, has written to the Minister of Agriculture stating that the next Government crop estimates are expected to show a reduction, owing to the damage done to the crops during harvesting.—*Times*, March 2nd, 1909.

The Board of Agriculture and Fisheries have been furnished by the Board of Trade with the following report,

**Agricultural Labour
in England
during February.**

based on about 210 returns from correspondents in various districts, on the demand for agricultural labour in February :—

The regularity of employment suffered generally no interruption from the weather in February. The forward state of farm work, however, affected the demand for day labourers in many districts, and in consequence the supply of such men was somewhat in excess of the demand.

Northern Counties.—Employment was generally regular in *Northumberland*, where, however, there was little demand for extra labourers. A fair demand for extra labourers was reported from certain districts in *Cumberland*, *Westmorland* and *Lancashire*, principally for carting and spreading manure and hedge-trimming. There was little or no interruption to outdoor work in *Yorkshire*, but in many districts the demand for day labourers was not equal to the supply.

Midland Counties.—Employment was generally regular in *Cheshire*; there was a fairly equal supply of and demand for labour, but a correspondent in the Tarvin Union mentions a scarcity of indoor farm servants. There was not much demand for day labourers in *Derbyshire* and *Nottinghamshire*, and some men of this class were consequently in irregular work. Threshing, manure carting and hedging provided a fair amount of employment for extra labourers in *Leicestershire*, and little or no excess in the supply of men was reported; there was some scarcity of men for permanent situations in the Market Harborough Union. The supply of day labourers was in excess of the demand in *Staffordshire*. Carting manure, threshing and hedging provided fairly full and regular employment in *Shropshire*. Employment was generally regular in *Worcestershire* and *Warwickshire*, with the supply of labour about equal to the demand. There was only a moderate demand for extra labourers in *Northamptonshire* and *Oxfordshire*; waggoners, cattlemen and shepherds, however, were somewhat scarce. The demand for labourers in *Buckinghamshire* and *Hertfordshire* was lessened on account of frosty weather, and some men of this class were in irregular work in consequence. There was also some surplus of extra labourers in *Bedfordshire*.

Eastern Counties.—Employment was generally regular in *Huntingdonshire* and *Cambridgeshire*, but in several districts the supply of day labourers was rather greater than the demand. In *Lincolnshire* threshing, ditching and hedging, &c., provided regular employment for most men, and the supply of and demand for labour were about equal. At the Horncastle Candlemas hirings no change in wages was reported. In *Norfolk* and *Suffolk* threshing, hedging, draining and ditching caused a fair demand for day labourers, but the demand was affected by the forward state of work, and in several districts there was some surplus of extra labour. Similar reports come from *Essex*.

Southern and South-Western Counties.—There was only a moderate demand for day labourers in *Kent*. Threshing, manure carting, hedging and ditching generally provided regular employment for extra labourers in *Surrey*. There

was a fair demand for day labourers in certain districts in *Sussex*, but in others the demand was poor on account of the forward state of farm work, and there was a surplus of labour in consequence. The supply of day labourers was also somewhat in excess of the demand in *Hampshire* and *Berkshire*, where work was likewise well forward. Employment was generally regular in *Wiltshire*, but the supply of day labourers was in excess of the demand, and some men were consequently in irregular work. Similar reports come from *Dorset*. Little or no irregularity of employment was reported from *Somerset*. There was generally an equal supply of and demand for extra labourers in *Herefordshire* and *Gloucestershire*, in parts of which counties, however, there was a continued scarcity of men for permanent situations. Regular farm servants were reported as somewhat scarce in *Devonshire* and *Cornwall*; there was also a fairly good demand for extra labourers on account of ploughing, potato planting, threshing and other work.

Agricultural Exhibition in Russia.—H.M. Consul at Warsaw (Mr. C. Clive Bayley) has forwarded a copy and translation of the programme of an Industrial and Agricultural Exhibition to be held this

Agricultural Exhibitions Abroad.

year from 5th August to 15th September at Czenstochowa (Piotrkow Government), together with a form of application for space for exhibits. Applications should be addressed to the Exhibition Committee, Ul: Panny Maryi No. 73, aleja III., partr, Czenstochowa, gub. Piotrkow, Poland, from whom particulars and forms can be obtained.

H.M. Consul remarks that although this exhibition is primarily a local one, yet foreign exhibits are greatly desired. These will not be admitted to compete with local products, but diplomas will be granted for excellence. All applications (in duplicate) must be sent in before 1st June, 1909.

The translation of the programme, &c., may be seen by British manufacturers interested on application at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E.C. (*Board of Trade Journal*, Dec. 17, 1908.)

Agricultural Exhibition in Spain.—The *Nachrichten für Handel und Industrie* (Berlin) reports that from 1st May to 31st July, 1909, an Agricultural, Commercial and Industrial Exhibition will be held at Valencia: In the first place, the exhibition will be devoted to products emanating from the three provinces of Valencia, Castellón, and Alicante; and, secondly, to foreign exhibits (without competition) of utility to those provinces.

All inquiries are to be addressed, together with a remittance of 2.50 pesetas (about 1s. 10d.) to the General Secretary of the Exhibition, Don José Ribera, Ateneo Mercantil, Valencia. Exhibits must be installed by the 20th April. All foreign products will be admitted free of Customs duty.

Regarding this exhibition, the British Vice-Consul at Valencia (Mr. E. Harker) writes that, although its main object is for local produce, the Committee are desirous of other nations participating. The foreign exhibits will not, however, be classified for competition with Spanish articles. The Vice-Consul suggests that cutlery, scissors, also scissors for cutting oranges, threshing machines for rice and wheat, and implements for reaping purposes would be specially suitable for exhibition. (*Board of Trade Journal*, Dec. 17th, 1908).

Agricultural Exhibition in Holland.—H.M. Consul at Amsterdam (Mr. W. A. Churchill) reports that an Agricultural Exhibition will be held at Twello, near Deventer, from the 21st to 25th July next. The Consul suggests that, though the exhibition may be too small to interest British manufacturers and agriculturists, it may be used by advertisers of agricultural implements. The Secretary is Mr. W. J. Lugard, Nieuw Emstermate, Twello, Deventer. (*Board of Trade Journal*, Jan. 28th, 1909).

MISCELLANEOUS NOTES.

Nitrate of Lime.—Nitrate of lime, manufactured by the Birkeland-Eyde process, to which reference has been made in previous issues of this *Journal* (Dec., 1906, p. 598; Dec., 1907, p. 694), is now being produced on a commercial scale at the works at Notodden. The present output, which is likely to be increased shortly, is stated to be 20,000 tons annually. It contains about 13 per cent. of nitrogen and 25-30 per cent. of lime, soluble in water. It may be used as a substitute for nitrate of soda and applied as a top-dressing, or part may be ploughed in at the time of sowing.

Up to the present, it has not been tested to any extent in this country, but in the few experiments which have been carried out to compare its action with other nitrogenous manures, the results appear to be satisfactory.

Demand for Agricultural Machinery in Natal.—The *Natal Mercury* of December 19, 1908, in an article on the increasing use of agricultural machinery in the Colony, remarks:—"It appears to be assured that a wide stimulation of agricultural activity is taking place all over South Africa, but particularly in Natal and the adjoining districts of the interior. . . . Agriculture is being conducted with more enterprise and on more up-to-date lines than has ever been known before. There are many signs which go to show that this is the case, but probably no more conclusive evidence could be forthcoming on the subject than the extent to which agricultural implements and labour-saving appliances are being purchased and brought into use by the farmers. Inquiries made in the best-informed quarters all confirm that this movement is making headway, and the local agents for farming machinery of various kinds are especially sanguine of a large extension of their business in the near future. They declare that the agricultural industry has entered upon a permanent phase of progressive growth in Natal, and point to the fact that within the last two years the demand for machinery and implements has increased very largely." (*Board of Trade Journal*, Jan. 21, 1909).

Export of Wheat from South Australia.—Among the recommendations made by the South Australian Royal Commission on the Marketing of Wheat are: (a) that an experiment in the bulk shipment of grain be conducted during the present year (1909); (b) that the Government, for experimental purposes, undertake the shipment of grain for farmers through the Produce Depôt, in the same way that lambs and other produce are dealt with; and (c) that parcels of wheat above the fair average quality standard be forwarded to Europe for experimental market purposes. (*Board of Trade Journal*, Jan. 21, 1909).

Encouragement to Agriculture in Panama.—H.M. Minister at Panama reports that the National Assembly of the Republic have voted a sum of £2,000 for the purpose of establishing small foreign labouring colonies in the provinces of the Republic which offer the most advantages for immediate development, and it is the intention of the Government to encourage Spanish emigrants to settle there. The Assembly have also voted a sum of £50 to be expended on "foreign agricultural publications of recognised utility," which are to be distributed among the principal farmers and agriculturists in the country. A sum of £100 has been voted for the purchase and distribution of grass and grain seeds, and an additional sum of £800 is assigned for the purchase and free distribution among the poor agriculturists of light labour-saving machinery of a kind adaptable to their work, such as mills to shell corn, light ploughs, and agricultural implements in general. (*Board of Trade Journal*, Jan. 21, 1909).

Supply of Phosphates in Natal.—At a meeting of the Weenen Agricultural Society, some very rich samples of phosphates of lime recently discovered near Weenen, in Natal, were exhibited. Particular attention was paid to the occurrence of the phosphates in nodular form, samples of which assayed from 85 to 92 per cent. There were also samples of the vein matter ranging from 54 to 65 per cent. It was pointed out that, at the present time, agriculturists were paying about five guineas per ton at Durban for imported phosphates ranging from 37½ to 40 per cent., and that before these phosphates were deposited upon the ground the cost reached about £8 per ton. It was estimated that the crude phosphate, in powdered form, could be supplied free on rail at Weenen station at £2 per ton, while the superphosphate from the same material could be sold at £3 per ton. The available supply of phosphate in Weenen County is estimated at 100 tons per day for fifty years, or more than a million and a half tons. (*Board of Trade Journal*, Feb. 4, 1909.)

Commission on Hop Industry in Bavaria.—The British Vice-Consul at Nuremberg (Mr. S. Ehrenbacher) reports that, at the instigation of the Deutscher Hopfenbauverein (German Hop-Growers' Association), a Hop Commission will sit in Munich towards the end of February or early in March to consider the present state of hop-growing in Bavaria. (*Board of Trade Journal*, Feb. 4, 1909).

Importation of Artificial Manures into Russia.—The British Vice-Consul at Reval reports that the imports of artificial manures into that port have shown an upward tendency for several years, the figures for the last two years being 413,558 pounds and 509,622 pounds respectively. They consisted chiefly of nitrate of soda, kainit, superphosphate, and Thomas-phosphate. Of the total quantity imported in 1907, 84,283 pounds came from the United Kingdom, 99,204 pounds from Belgium, and 326,124 pounds from Germany. It was composed of 118,061 pounds of nitrate of soda, 177,391 pounds of kainit, 30,672 pounds of superphosphate, and 183,487 pounds of Thomas-phosphate, the first three all from Germany and the last from the United Kingdom and Belgium. (*Board of Trade Journal*, Dec. 31, 1908).

Timber Resources of New South Wales.—The *Pastoralists' Review* (Melbourne) of 16th November states that, according to the recently published report of the Royal Commission appointed to inquire into the timber resources of New South Wales, the total quantity of commercial timber at present standing in the State, excluding timber growing on private lands, is estimated at 23,116,000,000 superficial feet, consisting of:—*Hardwoods*: Ironbark, 1,355,000,000 superficial ft.; other hardwoods for milling, 8,668,000,000 superficial ft.; for other purposes, 11,788,000,000 superficial ft.; total, 21,811,000,000 superficial ft. *Softwoods*: Cedar, 5,000,000 superficial ft.; hoop pine, 230,000,000 superficial ft.; other brushwoods, 150,000,000 superficial ft.; cypress pine, 920,000,000 superficial ft.; total, 1,305,000,000 superficial ft.

The Commissioners state that, at the present rate of consumption, the quantity of hardwood timber suitable for commercial purposes, estimated to be at present standing on the forest reserves and other Crown lands of the State, will not last more than about thirty-six years, and that the supply of softwoods will be consumed in a little more than twenty years. Amongst other things, the Commissioners recommend that the present royalties on certain timber should be increased, and that the export of ironbark and tallowwood beyond the Commonwealth should be prohibited for a period of ten years. Recommendations are also made for the replanting of the most valuable timbers and for the protection of timbers at present standing. (*Board of Trade Journal*, Dec. 31, 1908).

Diminution of the Peasant Class in Sweden.—A Commission has been appointed by the Minister of Agriculture in Sweden to examine the question of

the diminution of the peasant class in that country. It appears that the total number decreased from 457,000 in 1860 to 347,000 in 1900, or by 24 per cent. This has been partly due to emigration to America and partly to migration to the towns, and at the present time, when there are large numbers of unemployed in the towns, there is a great want of agricultural labourers in the country.

Protection of Plants in Straits Settlements.—An Ordinance of the Government of the Straits Settlements, dated 15th Sept., 1908, entitled "The Destructive Pests Ordinance, 1908," provides for regulations to be made for preventing the introduction or spread of any pest, and for prohibiting or regulating the landing in the Colony of any plant or part thereof.

Manufacture of Calcium Cyanamide in France.—The first factory for the production of calcium cyanamide in France has been established at Notre-Dame-de-Briançon, Savoy. A description of the method of manufacture, &c., is given in the *Journal d'Agriculture Pratique*, 3rd Sept., 1908.

OFFICIAL CIRCULARS AND NOTICES.

The Board of Agriculture and Fisheries have, by the Agricultural Holdings (Scotland) Rules of 1909, dated February 3rd, 1909, prescribed the form of an award in an arbitration under the Agricultural Holdings (Scotland) Act, 1909, where compensation is claimed for tenants' improvements, together with other forms for proceedings in arbitrations under that Act.

The Board of Agriculture and Fisheries have addressed a circular letter, dated February 20th, 1909, to county councils and the councils of boroughs, urban districts, and parishes in England and Wales, pointing out that the Board are required, under Section 59 of the Small Holdings and Allotments Act, 1908, to present to Parliament an Annual Report of the proceedings of the several county, borough, district, and parish councils under the Act, and that it is the duty of every such council, before such date in every year as the Board may fix, to send the Board a report of their proceedings under the Act during the preceding year.

Forms in which the reports should be made have been prepared, and the local authorities in question are requested to supply the desired information before March 20th next.

The following Memoirs of the Geological Survey have been recently published:—

Publications of the Geological Survey. *The Water Supply of Kent.*—This memoir deals very fully with the springs and underground sources of water supply in the county of Kent. It contains a general description of the geological formations of the county, with special reference to their water-bearing characters, and includes notes on swallow-holes, intermittent streams, &c. The main portion of the work comprises particulars of wells and borings for water, and records of other borings, notably of those in the Kent Coal district. Analyses of waters are also given, and there is an extensive bibliography of works relating to the water supply. In addition, the Memoir is accompanied with a Rainfall Map of the County, with explanatory report and statistics.

Copies may be obtained from any agents for the sale of Ordnance Survey Maps, or directly or through any bookseller from the Ordnance Survey Office, Southampton, price 8s. 6d.

Water Supply of Bedfordshire and Northamptonshire.—This Memoir deals with the water supply of the above counties from underground sources, and contains a general description of the geological formations with reference to their water-bearing capacities. Sections are devoted to well-sinkings and borings, and to the analysis of waters, with notes on mineral springs. The Memoir also contains rainfall maps. Copies may be obtained as above, price 4s. 6d.

Geology of the Country near Oban and Dalmally.—This Memoir describes the geology of the mountainous ground between Loch Creran and Glen Orchy, and the undulating country between Oban and Dalmally and on either side of Loch Awe. Copies may be obtained as above, price 2s. 6d.

Geology of the Country between Newark and Nottingham.—The Memoir is an explanation of Sheet 126 of the colour-printed geological map, and describes the geology and physical features of the country bordering the River Trent between Nottingham and Newark, extending S.E. to the margin of the Vale of Belvoir and N.W. to near the head of the Leen Valley. The economic geological products are dealt with, together with the water supply and the agricultural characters. Copies may be obtained as above, map, price 1s. 6d., memoir, price 2s. 3d.

The bound volume of the Board's leaflets, Nos. 101-200, is now ready. This edition includes an exhaustive index to the different subjects dealt with in the leaflets, as well as a special index to the insecticides and fungicides recommended.

Leaflets of the Board of Agriculture. Copies can be obtained on application to the Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W., price 6d. post free. In remitting money, amounts of sixpence and upwards should be sent in the form of postal orders or cheques.

SUMMARY OF AGRICULTURAL EXPERIMENTS.*

MILK, BUTTER, AND CHEESE.

Effects of Feeding on Milk and Butter (Lancs. Educ. Comm., Agric. Dept., Farmers' Bull., No. 5).—In 1906 the values of bean meal, undecorticated cotton cake, and gluten meal as foods for dairy cattle were compared with reference to the quality and composition of the milk produced, and the flavour and quality of the butter and cheese made from it. The first experiment on summer feeding commenced on 11th June and lasted for thirteen weeks. Fifteen cows were fed on the ordinary farm ration of 5 lb. of mixed bean meal and maize meal, the cows being at pasture during the day, and their milk was weighed and tested morning and evening.

After a fortnight three lots of four each were selected, corresponding as closely as possible in yield, percentage of fat, and lactation period, and were fed on the following rations:—Lot 1.—Bean meal 3 lb., maize meal 1 lb., bran 1 lb., costing 2s. 4d. per week.

* A short review or summary of the experiments carried out in this country, classified according to subject, is given monthly. (The first appeared in the issue for September, 1908.) This summary is not intended to do more than give a brief indication of the character of the experiment and of the conclusions reached. Those who are interested in any particular investigation can refer for further details to the original publication. The Board would be glad to receive for inclusion in this summary copies of reports on inquiries, whether carried out by agricultural colleges, societies, or private persons.

Lot II.—Undecorticated cotton cake 3 lb., maize meal 1 lb., bran 1 lb., costing 1s. 9d. Lot III.—Gluten meal 3 lb., maize meal 1 lb., bran 1 lb., costing 2s. per week. The lot receiving cotton cake gave 700 gallons of milk in the sixty days, those receiving bean meal gave 669 gallons, and those receiving gluten meal gave 648 gallons. Valuing the milk at 7d. per gallon, and allowing for the difference in the cost of the foods, the cotton-cake lot made a relative profit of almost £2, or about 10s. per cow more than the other two lots, which gave practically the same return. The cows fed with gluten meal and bean meal showed a greater tendency to lay on flesh than those fed with undecorticated cotton cake.

The percentage of fat in both night and morning's milk increased as the lactation period advanced, but the solids not fat remained practically constant. The various foods did not appreciably influence the percentage of fat or solids not fat in the milk.

The winter feeding experiment was commenced on 28th January, 1907, and was conducted with three groups of three cows each. In order to eliminate, as far as possible, errors due to the individuality of the cows, the groups were put alternately on the foods to be tested, allowing a week between each change for the cows to get used to the food. The rations consisted of hay 21 lb., mangolds 28 lb., bran meal 3 lb., maize meal 2 lb., and in addition 5 lb. of either bean meal, undecorticated cotton cake, or gluten meal. The cost was 1s. 1½d., 1s., and 1s. 1d. per day respectively. When gluten meal was used, crushed oats were substituted for maize meal to give variety, as gluten meal is a product of maize.

In nine weeks the three cows fed with gluten meal gave 551 gallons of milk, those fed with bean meal 537 gallons, and with cotton cake 523 gallons. The gluten meal gave the greatest profit, while bean meal, owing to its greater cost, was less profitable than cotton cake. The nature of the food again had no appreciable influence on the percentage of fat or of solids not fat in the milk.

Butter and cheese were made from the milk in this experiment, and it was considered that bean meal proved best for the production of butter, being closely followed by the undecorticated cotton cake. Gluten meal did not equal the other two. For cheese, bean meal was the best, but gluten meal gave nearly equal results; undecorticated cotton cake was less satisfactory.

Milk Records (Univ. Coll. of Wales, Aberystwyth, Rept. on Expts., 1906).—The College herd consisted of nine well-bred Welsh black cows, two pedigree Herefords, and fourteen pedigree and non-pedigree Shorthorns. The milk has been weighed daily and tested monthly since the autumn of 1904. The average yield of the Shorthorns during 1906 was 624 gallons, of the Welsh 545 gallons, and of the Herefords 481 gallons. As regards richness the Welsh cows were first, 25 lb. of their milk being required to make 1 lb. of butter, the figures for the Shorthorns and Herefords being 26 and 27 lb. respectively. The larger yield of the Shorthorns, however, made them the most profitable, as they averaged 242 lb. of butter, against 219 for the Welsh and 178 for the Herefords. Records are given showing the yield of each cow, and the percentage of fat for different periods. Eight of the Shorthorns were Cumberland cows, and their average milk yield was 706 gallons.

Less cake was used in the winter of 1905-6 than in 1904-5, and a table is given comparing the yield of thirteen cows during the two periods. On the whole, there was a decrease, the value of which was much more than the saving in food-stuffs. It is observed that after a two years' trial the practice of giving concentrated foods to dairy cows has justified the extra expenditure, as on all occasions when the supply was stopped the yield of milk fell to an extent quite out of proportion to the cost of the food saved.

Milk Records (Journ. Brit. Dairy Farmers' Assoc., Vol. XXIII., 1908).—The milk supplied to the British Dairy Institute, Reading, was tested for fat daily (except Sundays) in 1907, and the records are given in the report, with particulars of the feeding of the cows. In one herd the times of milking were 5 a.m. and 3 p.m., and in the other 5.30 a.m. and 3 p.m. In only three of the 564 tests of morning milk was the percentage of fat found to be less than 3, in one case 2·8, and in two cases 2·9. The evening milk was always above 3 per cent.

The results of the milking trials and of the butter tests at the Dairy Show of 1907 are given in the same report.

Milk Records (Edin. and East of Scotland Coll. of Agric., Bull. 14).—The records of the dairy herd at Rosslynlee in 1905-6 were summarised in the *Journal*, July, 1907, p. 205, and the above report contains the results obtained during 1906-7. The milk of each cow is weighed at every milking, and samples of the morning and evening milk of each cow are analysed one day a week. Tables are given showing the weekly yield of each cow, and percentages of fat during the year.

The mixed milk of the herd never contained less than 3 per cent. of fat, but many of the cows, whose average percentage of fat is well above 3 per cent., gave from time to time milk containing less, especially in the morning.

In 1906-7 the average percentage of fat in the morning milk was 3·49, and in the evening 3·98, whereas in the previous year the figures were 3·34 and 3·99. Since May, 1907, the milking has been done at intervals of eleven and thirteen hours, whereas previously the intervals were 9½ and fourteen hours, and although the alteration had only been in operation for four months out of the twelve under review, it was considered that the more equal percentage of fat was largely due to the change.

The records of yield show the great difference in the value of the produce of different cows. Of eleven cows that were in the herd for the whole year, the heaviest milker gave 1,170 gallons, which at 6½d. per gallon would be worth £31 13s., while the worst cow gave 606 gallons, worth £16 8s., a difference of £14 5s.

The records obtained are being used as a means of improving the herd by breeding and selection. The heifer calves of cows that are heavy milkers and give milk of good quality are being kept with the view of gradually eliminating the poorer animals from the herd.

Milk Records (West of Scotland Agric. Coll., Bull. 44).—The milk of every cow in the herd at the Kilmarnock Dairy School was weighed and sampled twice daily for twenty-six weeks, beginning on 2nd April, 1906. The records are given, and are compared with similar records obtained for the same number of weeks and over the same period of the year by the Highland and Agricultural Society with a herd in Dumfriesshire and another in Ayrshire.

The reliability of milk records based on samples taken at various intervals was also examined. The estimate based on the occasional samples was under the actual amount when the whole of the cows were considered, when the interval was seven days, but above it when the interval was longer. The possibility of error in the estimate increased with a longer interval, the error on the average for the seven-day interval being apparently doubled at fourteen days, trebled at twenty-one days and quadrupled at twenty-eight days.

Milk Records (Highland and Agric. Soc., Transactions, Fifth Series, Vol. XX., 1908).—A report is given on the results obtained in 1907 in the experiments in milk testing, which are now in their fifth season. These experiments were described in an article by Mr. John Speir in this *Journal*, September, 1907, p. 320.

Milk Records (Lancs. Educ. Comm., Agric. Dept., Bull. 5).—This experiment was intended to ascertain the degree of accuracy attained by sampling at intervals of one, two, three, or four weeks. The conclusion reached is that the total yield of milk and the percentage of fat contained in it can be estimated with approximate accuracy by weighing and testing the morning and evening milk on one day each fortnight, and multiplying the average of the two results by fourteen. When the test was made on one day in three weeks, although the average result from twelve cows was approximately correct, the error was considerable in the case of individual cows. A note on these experiments was given in this *Journal*, March, 1908, p. 740.

Milk Records (Essex Educ. Comm., Notes on Agric. Analyses, 1903-6; Harper-Adams Agric. Coll., Field Expts., Report, 1907).—Records are given in the Essex Report of the composition of the milk of a herd for two years, and of another for three years.

The Harper-Adams Report contains the results obtained from the samples submitted by farmers, and also records of production and percentage of fat in milk from nine cows in the College herd. A note on the variations observed at this centre in milk taken from the top and from the bottom of a churn during delivery was given in this *Journal*, June, 1908, p. 213.

Effect of Milking Intervals on the Composition of Milk (Camb. Univ. Dept. of Agric., Guide to Expts., 1907).—Three cows were milked for a fortnight at equal intervals, and for a fortnight at unequal intervals (16 and 8 hours), and diagrams are given showing the composition and yield of the milk of each cow during the period. The composition of the milk of the individual cows varied greatly from day to day, but with milking at equal intervals the percentage of fat was generally above 3, while with unequal intervals the percentage in the morning's milk was usually (in the case of one cow always) below 3. With equal intervals the average percentage was, morning 3·59, evening 3·43; with unequal intervals, morning 2·40, evening 4·41.

Effect of Milking Intervals and of Rain on the Composition of Milk (Lancs. Educ. Comm., Agric. Dept., Bull. 5).—In the course of the experiments comparing different concentrated foods referred to above, some causes of the variations in the percentage of fat in milk were investigated. The intervals between the times of milking were 10½ and 13 hours, and the morning's milk contained from 6 to 8 per cent. less fat than the evening's. On Sundays, however, the cows were milked ¼ hour earlier in the afternoon, the intervals then

being $9\frac{1}{2}$ and $14\frac{1}{2}$ hours, with the result that the difference in the percentage of fat was slightly greater. In addition, the total yield of milk was less. It was noted that a fall of rain after a period of drought had a considerable effect on the composition of the milk. The figures for the composition and yield of the cows on seven occasions after rain had fallen are given, and in every case there was an increase in the fat contents, varying from '09 to '78.

Various Experiments with Milk, Cream, and Butter (Journ. Roy. Agric. Soc., Vol. 68, 1907).—Experiments were carried out in the dairy at the Lincoln Show to ascertain (1) the comparative weight and value of a given quantity of cream from the milk of various breeds; (2) the comparative weight of a given quantity of milk of the various breeds; and (3) the effect that the artificial colouring of milk and butter may have on the mind of the purchaser, and so on the sale price of these articles of food.

As regards the weight and value of cream, it was found that the South Devon and the Channel Islands breeds produced the best and most valuable cream.

As regards the weight of milk, it was found that the average weight of one gallon of milk from Shorthorns was 10 lb. $4\frac{1}{2}$ oz., from Ayrshires 10 lb. 5 oz., and from Jerseys 10 lb. $2\frac{1}{2}$ oz. The other breeds ranged from 10 lb. 4 oz. to 10 lb. $4\frac{1}{2}$ oz. The richer the milk, the lighter it was in weight, and the evening milk was generally lighter than the morning milk.

As regards the colouring of milk, the point raised was tested by asking those who were watching the proceedings in the dairy to give their opinion on milks of various shades. The experiment apparently demonstrated what it was intended to do, viz., that the general public judge milk by its colour. It is pointed out that to colour the paler milks so as to pass them off for the milks richer in fat is a practice that cannot be commended. Experiments of a similar nature were carried out with butter. In every case the pale butters were voted the worst, the deepest in colour always being preferred.

The results of the milk and butter tests at the Lincoln Show are given in the same report.

Method of Milking (Harper-Adams Agric. Coll., Field Expts., Report, 1907).—The object of this experiment was to test the effect of agitation of the udder on the amount of fat in milk yielded by (a) easy milking cows and (b) difficult milking cows. A note on these experiments was given in the *Journal*, June, 1908, p. 213.

Variation in the Chemical Composition of Butter (Univ. of Leeds, Bull. 62 and Bull. 66).—For the purpose of investigating the causes of the variation in the chemical composition of butter, 126 samples of butter made on the Manor Farm, Garforth, in 1904-6 were analysed, and the results are discussed in Bull. 66, while in Bull. 62 an explanation is given of the nature of butter fat, the influence of period of lactation, influence of food, and other conditions.

Caerphilly Cheese (Journal of the Bath and West and Southern Counties Soc., Fifth Series, Vol. II., 1907-08).—Experiments were carried out at the Newport Exhibition with the view of solving a question of local interest, viz., whether it is more profitable to make Caerphilly cheese from whole milk, or to take one skimming of cream, churn the cream into butter, and convert the skimmed milk into cheese—a practice prevailing in the district. The cheeses made from whole milk would,

in the ordinary course, be better than those made from skimmed milk, and should command a higher price. But whether the higher price exceeds the price of the cheeses made from the skimmed milk, plus the butter obtained from the cream, was a point which it was thought the experiments would elucidate.

Milk from Jersey and Kerry cows was used, and it appeared that the richer Jersey milk yielded a more profitable return when cheese was made from skimmed milk and butter obtained from the cream; while it seemed that, in the case of Kerry milk and milk not so rich in fat as Channel Islands milk, it was better to make cheese from the whole milk, and discard the idea of getting butter at all from the milk required for cheese making.

WEEDS, INSECTS, AND FUNGUS DISEASES.

Effect of Weeds on Root Crop (*Univ. Coll., Reading, Results of Expts.*, 1907).—This experiment was intended to test the effect of weeds in reducing the crop of mangolds, and also to demonstrate the effect of hoeing the ground. The yields were as follows:—(1) No weeding after setting out the plants, $15\frac{1}{4}$ tons; (2) hand weeding only, no hoeing after setting out the plants, 40 tons; (3) kept clean by hoeing, $39\frac{1}{2}$ tons; (4) hoed twice only, $37\frac{1}{4}$ tons; hoed once only, $33\frac{1}{2}$ tons. There was practically no difference between the plot hand-weeded and that where the weeds were destroyed by hoeing. Hoeing the land had apparently no effect on the crop, but the wet season may have had some effect on this result, as it is usually considered that hoeing is useful, apart from its beneficial effect in killing weeds. Two hoeings increased the crop by four tons per acre, as compared with one hoeing.

Spraying of Charlock (*Univ. Coll. of Wales, Aberystwyth, Dept. of Agric., Rept. on Expts.*, 1906).—Four plots in different districts were sprayed in June with a 3 or 4 per cent. solution of copper sulphate. When the plots were inspected a week or two later, the charlock was almost completely destroyed, while on a strip on one plot that had been left unsprayed it was in full flower and overtopped the barley.

Spraying of Charlock (*Lancs. Educ. Comm., Agric. Dept., Farmers' Bull.* 4).—This bulletin gives a description of charlock, and of the injury it does to crops, and suggests methods of extermination. Several machines are described and illustrated. One which can be attached to a farm cart will spray 20 acres per day and upwards; this costs £8 15s., and the cost of materials and labour 5s. 3d. per acre. Another machine spraying 12 acres a day costs £6 15s. There are also smaller machines, including a knapsack sprayer, costing £1 16s., and spraying three acres per day. It is suggested that farmers might combine to buy a sprayer of a suitable size. In the experiments made in Lancashire, it has been found that the sulphate must be finely crushed and of 98 per cent. purity, and the water clean. A 3 per cent. solution should be applied at the rate of 50 gallons per acre. The weather should be calm, and not too bright, with a probability of remaining fine for at least twelve hours after the spraying. The best results have been obtained when the majority of the plants are in flower, and before the formation of seed pods has progressed to any extent. A certain proportion of the plants escape, and a second spraying is advisable a fortnight after the first.

Spraying of Charlock (Univ. Coll. of North Wales, Bangor, Bull. VII., 1907).—The experiments and demonstrations in charlock-spraying at this centre have extended over ten years, and this bulletin gives the result for 1907. In the moist climate of Wales a 4 or 5 per cent. solution, applied at the rate of 50 gallons per acre, has been found more reliable than a 3 per cent. solution.

Spraying of Charlock (Field Expts., Harper-Adams, Agric. Coll., Report, 1907).—A spraying machine was lent to farmers at a nominal charge, and reports of some of the results obtained are given.

Destruction of Spurrey in Corn (Univ. Coll. of North Wales, Bangor, Agric. Dept., Bull. IX. 1906; Bull. VII., 1907).—It was noticed that spurrey was very abundant in a field at Woburn that had received repeated dressings of ammonia manures, and it was thought that the repeated manuring had made the soil acid and favourable to the growth of spurrey. When part of the field was treated with lime, the spurrey disappeared. The effect of similar treatment was tried on two plots near Capel Curig, which were dressed with 10 cwt. and 1 ton of ground lime respectively before the corn was sown. At harvesting there was practically no difference between the untreated plot and those dressed with lime. Another plot was sprayed after the corn and spurrey had made some growth with fifty gallons per acre of a 5 per cent. solution of copper sulphate, with the result that the spurrey was completely destroyed. A similar result was obtained in 1907 at Bodorgan, where a considerable quantity of spurrey appeared in one of the fields. Solutions of 3, 4, and 5 per cent. were used, and all were more or less effective. Where the 3 per cent. solution was applied, about half the spurrey plants formed seed, while on the other plots all the spurrey plants were greatly weakened, and not more than 20 per cent. of them formed seed.

Prevention of Damage to Red Clover by Pear-shaped Weevil (Univ. Coll. of North Wales, Bangor, Agric. Dept., Bull. XI., 1907).—The weevil in question is *Apion apricans*, which causes much damage in the Vale of Clwyd. Five small plots were dressed with slaked lime and flowers of sulphur, Bordeaux mixture, or solutions of lead nitrate. On none of the plots was the treatment very successful, but the dusting with 100 lb. lime and 20 lb. flowers of sulphur per acre gave the best results. It is probable that if three or four dressings were given in the flowering period at intervals of a week, the damage might be further diminished.

*"Blindness" in Barley (*Helminthosporium gramineum*) (Camb. Univ., Dept. of Agric., Guide to Expts., 1907).*—Seed barley was steeped in various solutions. The experiment was described in the *Journal*, February, 1908, p. 670. The treatment recommended is to steep the seed in water containing formalin in the proportion 1 to 160 or 200 parts.

Prevention of Clover Sickness (Essex Educ. Comm., Field Expts., 1906).—This investigation was carried out in a district where it is usually considered unsafe to grow clover more often than once in eight or even twelve years. Ten plots were treated with various manures and with sulphur, peroxide of hydrogen, "nitragin," and lime. The best results from a practical point of view, were obtained from the use of two tons of ground lime per acre. Clover was grown in 1904 and 1906, and in 1904 75 per cent. of the "plant" on the lime plot survived, while in 1906 it was practically a full "plant." No clover disease (*Sclerotinia*).

trifoliorum) was found on this plot in either year. Disease was very prevalent on a plot that received farmyard manure.

Effect of Spraying on Mildew in Swedes (Univ. Coll. of North Wales, Bangor, Bull. IX., 1906).—Three plots of $\frac{1}{10}$ acre each of swedes affected with mildew were treated as follows:—(i) sprayed with a solution of 24 lb. sulphate of copper, 30 lb. washing soda in 120 gallons of water per acre; (ii) sprayed with a solution of 1 cwt. nitrate of soda in 120 gallons of water per acre; (iii) dressed with 1 cwt. nitrate of soda per acre, applied as a powder. A fourth plot was not treated. Some improvement seemed to take place on all three plots, but the improvement was only apparent, as the weight of roots on all plots was practically equal.

Finger-and-Toe Disease (Field Expts., Harper-Adams Agric. Coll., Report, 1907).—A trial was made with the view of comparing the results obtained by using different forms of phosphatic manure as a preventive of finger-and-toe disease among swedes. The disease was, however, entirely absent on this side of the field. Another field was cross-dressed in the following manner:—Plot A, $2\frac{1}{2}$ tons per acre of lime slaked on the ground; Plot B, no lime; Plot C, 1 ton per acre, ground lime. The results were:—Plot A, all sound; Plot B, 10 per cent. diseased; Plot C, 6 per cent. diseased.

Four disease-resisting varieties were sown, but as the disease was practically absent, no results were obtainable. The yield per acre of these four varieties was less than the main crops.

Potato Diseases (Field Expts., Harper-Adams Agric. Coll., Report, 1907).—Spraying with Bordeaux mixture was tested, two dressings being applied, one late in July and the second early in August. The sprayed plot produced 1 ton 16 cwt. per acre of saleable potatoes more than the unsprayed plot, which represented at current prices a value of £6 15s. The cost of the spraying was 17s.

A series of experiments was arranged on land known to produce scab,—salt, lysol, carbolic acid, and copper sulphate being applied as dressings. The only one that was effective was the copper sulphate, with which further experiments will be arranged.

Scab on Potatoes (Univ. of Leeds, Bull. 63 and 70).—It has been noticed that scab is more prevalent in a dry than in a wet season, and in Yorkshire it is confined chiefly to sharp sand and gravel soils. In 1906 and 1907 plots of land especially liable to produce scab were treated with substances capable of retaining moisture—sawdust, shoddy, rape meal, and peat moss, in each case both with and without salt. The sawdust and peat moss were soaked in water.

The best result was obtained from a dressing of about 50 cwt. of sawdust (wetted) applied over the sets at planting time. The addition of 5 cwt. of salt materially reduced the yield. It is thought that the beneficial effect of sawdust may to some extent be due to the protection which a covering of this material affords the tubers against the attacks of *Oospora scabies*.

Soaking the seed in a solution of formalin (8 fluid oz. commercial formalin to 15 gallons water) reduced the scab.

An experiment on a small scale was made with sterilised soil. Potatoes free from scab and treated with formalin were planted in buckets of sterilised and unsterilised soil. No scab was found in the produce from the sterilised soil, and the yield was two to three times

greater than that from the unsterilised soil. All the tubers from the unsterilised soil were affected.

Spraying of Potatoes (Univ. Coll. of North Wales, Bangor, Agric. Dept., Bull. VI., 1906, and II., 1907).—These experiments have been carried on at a number of centres since 1901. The solution consists of 24 lb. sulphate of copper, 30 lb. pure washing soda in 120 gallons of water. The spraying has invariably produced an increase of the crop. When both sides of the leaves are sprayed, the crop is usually greater than when the upper side only is sprayed. Prof. Winter considers that this is due to the more thorough spraying, and not to the fact that disease gains admission on the under side of the leaves. He observes that “the spraying has no direct effect on potato disease. So far as the disease is concerned, it is of little consequence whether the liquid is applied to the upper or lower sides of the leaves. The copper salts (in a manner not yet explained) so act on the leaves as to give the plants increased vigour, with the result that they keep growing for a longer period, produce a larger quantity of marketable potatoes, and are better able to resist disease.”

This view suggested the question whether the increased vigour due to spraying might not form a substitute for a change of seed. Experiments at three centres in 1907 appeared to show that the old seed, when sprayed, gave a crop almost equal to that of new unsprayed seed. The effect of spraying was still greater on the new seed, and the conclusion is that it would be a mistake to regard the two as interchangeable, and that if the best results are to be obtained both change of seed and spraying should be practised.

FRUIT AND CIDER.

Effect of Pruning on Apple Trees; Effect of Grass on Apple Trees (Harper Adams Agric. Coll., Field Expts., 1907).—This experiment was commenced in 1902 with twenty-four trees. In 1907, as in 1906, the unpruned trees formed more buds than the pruned trees. The average increase in diameter of the stem of the unpruned trees is less than that of those pruned regularly, the average diameter of the former at $4\frac{1}{2}$ ft. from the ground being 1'82 in. and of the latter 2'09 in.

The results of the experiment to compare the growth of trees when planted on grass or on cultivated ground were given in this *Journal*, May, 1908, p. 123.

Planting of Fruit Trees (Woburn Experimental Fruit Farm, Ninth Report, 1908).—This report gives an account of the experiments carried out at Woburn and elsewhere in regard to methods of planting fruit trees. The results are summarised on p. 937 of this issue of the *Journal*.

Investigations into Cider (National Fruit and Cider Institute, Reports for the years 1906 and 1907).—The report for 1906 contains the results of the experimental work as regards (1) ciders made from single varieties; (2) the rate of fermentation; (3) keeving, maceration, and filtration; (4) the influence of yeasts and bacteria on flavour. The report for 1907 deals with (1) the characters of single variety ciders; (2) the storage of cider fruit; (3) mill tests; (4) maceration; (5) the control of the fermenting liquor; (6) the influence of aeration; (7) the time of filtration; (8) the improvement of low quality ciders; (9) cider sickness; (10) the relations between the quality of the fruit and the

methods of treatment of the trees; (ii) the fermentation of ciders with selected yeasts. A description of a new method of fruit bottling is also given. The reports include the results of the analyses of apples and pears made at the Institute.

DISEASES OF LIVE STOCK.

Mortality among Lambs (Harper-Adams Agric. Coll., Field Expts., Report, 1907).—In response to an application from certain Shropshire farmers, the Salop Education Committee asked the College authorities to undertake an investigation into the cause of a severe mortality among lambs. Mr. W. T. Wilson, F.R.C.V.S., carried out this work, and found that the lambs were infested with worms. A description of the Broad Tape Worm and the Stomach Round Worm is given, with recommendations for treatment.

Tuberculin Test (Univ. Coll. of Wales, Aberystwyth, Dept. of Agric., Ann. Report, 1906).—The results are given of testing the College herd with tuberculin. Six out of twenty-five cattle reacted, and were disposed of at a loss of £48. A brief description of tuberculosis and of the tuberculin test is added.

ANALYSES OF FEEDING STUFFS, SOILS, ETC.

Reports on Analyses (Roy. Agric. Soc. of England, Journal, Vol. 68, 1907; Bath and West and Southern Counties Soc., Journal, Fifth Series, Vol. II., 1907-8; Highland Agric. Soc., Transactions, Fifth Series, Vol. XX., 1908; Harper-Adams College, Field Expts., Report, 1907).—These publications contain observations by the consulting chemists on samples submitted for analysis during the year.

Report of the Analytical Dept. (Midland Agric. Coll., Bull. II., 1907-8).—This report contains observations on the samples received during the year. Some demonstrations were conducted in pots of sand supplied with basic slag containing equal weights of phosphates in the soluble form, insoluble in citric acid, and in the form of coarse material which would not pass through a sieve with 100 meshes to the lineal inch. The soluble phosphate produced a good crop, while the insoluble and coarse phosphates gave little result.

Notes on Agricultural Analyses, 1903-6 (Essex Education Committee).—This publication contains a report on the soils of the Tendring Hundred, together with observations on the various samples submitted, including fertilisers, cakes, and other feeding-stuffs, milk, and water. One section deals with the composition and digestible constituents of seven concentrated foods.

Report from the Analytical Laboratory (South-Eastern Agric. Coll., Journal, No. 16, 1907).—This report contains observations and explanatory notes on the samples of manures, feeding-stuffs, milk, and water sent to the laboratory, together with an article on soil analyses, giving the composition of various types of soil. Some notes on the manuring of fruit trees are also given.

Vitality of Seeds (Roy. Agric. Soc. of England, Journal, Vol. 68, 1907).—The experiments as to the life of farm seeds, which have been carried on for twelve years, are being continued.

THE CORN MARKETS IN FEBRUARY.

C. KAINS-JACKSON.

The wintry weather which marked the entire course of February is the feature by which operators at Mark Lane will for the most part recall the month, but the influence of climate on retail demand, though considerable, was by no means the only cause of the rise in prices, which was at first difficult to effect, but had by the last few days of the month become an accomplished fact. The great trade struggle which would have made the month of interest quite apart from weather was between the strengthening influence of North American movements, largely speculative, and the weakening influence of large and well sustained shipments from the Southern Hemisphere, Australia collaborating with Argentina in this matter. Even without the aid of a good home demand, the North American influence would probably have proved of most power, for the shipments of Australia and La Plata had been by the end of the month largely annexed by Continental buyers, and the quantities coming to British ports were not excessive.

Wheat.—The price of English wheat at the completion of the first half of the cereal year, a period of 26 weeks from the 1st September, was 32s. 2d., and as compared with the like period in the previous cereal year represented a decline of about 1s. 1od. per quarter. The average price for England and Wales in the last week of February, however, shows an increase of 3s. 6d. per qr. on that of the last week of February, 1908.

Wheat, on the whole, has, despite good home harvests, tended to rise in price since 1906, but the eagerness to realise soon after harvest causes more depression than ever, and is a tendency which in the interests of a profitable agriculture requires to be abated. The prices with which February closed in London were 36s. to 39s. per 504 lb. for good heavy English, 42s. to 44s. for strong Russian, 40s. to 44s. for the four chief grades of Manitoba, and 40s. to 41s. for Durum. For La Plata wheat on passage 38s. was about the price asked. A small quantity of the new crop arrived at Liverpool, and was sold at 8s. 7d. per cental (41s. 3d. per 480 lb.), but for delivery a fortnight later 8s. 4d. was accepted (40s. per 480 lb.). Some interest has attached to the separate quotation of Alberta wheat, the fine Canadian produce of what has been called a "climatic sheltered backwater," where winter wheat can be grown, although it lies in a latitude where it is usually only possible to grow spring wheat. The price paid has been 8s. 3d. per cental at Liverpool, and 39s. 6d. to 40s. per qr. in London. Wheat shipments for February included 2,801,000 qrs. from Argentina, and 1,037,000 qrs. from Australia, while North American shipments fell away materially as the natural result of a 2s. 6d. per qr. rise in prices in the United States.

Flour.—The milling interest was struggling early in the month against a slow demand from bakers, but before February closed the latter came forward and bought very freely, the cause of the activity being in part the large sales of bread owing to the cold weather, and in part the renewed ability to purchase without loss due to the rise of a halfpenny on the quartern loaf. The price of bread for February

in London was 5½d., but the bakers agreed in the course of the month to make it 6d. as from 1st March, and this price now rules. The millers share in the advantage, and are getting 34s. for best London flour, 30s. for Town Households, for fine country patents, and for Australian. About 26s. still suffices to purchase ordinary country flour and such serviceable American "first bakers" grades as Iron Duke. The quantity of flour on passage at the end of February was below the average, and North American shipments for the month were only 378,000 sacks.

Barley.—The sales of English have been smaller than usual, while those of both Californian brewing and of Russian feeding grade have exceeded the average. The prices have ranged from 32s. to 38s. per 448 lb. for English malting barley, 33s. to 34s. per 448 lb. for Californian brewing, and 21s. 6d. to 22s. 3d. per 400 lb. for Russian (with which may be grouped Persian and Indian) feeding barley. At the close of the month the pressure of 385,000 qrs. of Californian on passage caused a shilling decline in the price of that type, which should now, in view of the scarcity of home produce of brewing quality prove serviceable. Only 30,000 qrs. are on passage from Anatolia, and the demand decidedly exceeds the supply. Imports of barley for the first half of the cereal year were over 3½ million quarters, but it by no means follows that the imports for the cereal year will be seven millions (which would be a somewhat large supply). In most cereal years the imports of the first six months much exceed those of the remaining six. February shipments from Russia were 518,000 qrs., a rather liberal exportation for a winter month. All other shipments did not exceed 200,000 qrs.

Oats.—A few markets only quoted an average of 19s. for British oats in February, and farmers have continued to use this grain as much as possible on the farm. The tendency at the end of the month was towards a price advance in all parts of Great Britain, and it is expected that those who have kept stocks for the winter to condition will obtain, before this cereal year is out, prices sufficient to pay interest on the locked-up capital. The Argentine shipments of oats have been 584,000 qrs., as compared with 376,000 qrs. shipped by Russia. The quantity of oats on passage is very heavy, but Continental purchases are increasing. The value of foreign light oats had by the end of the month settled down to a tolerably level 5s. per cental where large quantities, a thousand centals or more, could be placed. Buyers of a single quarter (304 lb.) had often to pay 16s., but the arrival of 200,000 qrs. into London during the last ten trading days of the month caused an increased willingness on the part of holders to meet buyers. The Russian oats are in fitter state for prompt use than the Argentine.

Maize.—Speculation has had a good deal to do with the advance of maize prices at New York, but the 27s. per qr. quoted on February 27th as compared with 24s. 9d. at the end of December and 25s. 4d. at the end of January was a value reflecting very strong holding on the part of American farmers, as well as a bullish attitude of the merchants holding the 1,435,500 qrs. in store. With less in store as against a year ago, despite a larger crop, the demand for a higher price may be considered natural. But London during February con-

tinued to get all the maize it required at about 28s. per qr. Freights are very low, 1s. 4d. to 1s. 6d. per qr., but even 1s. 4d. makes 27s. up to 28s. 4d., and with landing charges to at least 29s. on the London market. At Liverpool maize hardened a little as the month progressed, and our chief maize exchange closed at 5s. 8d. per cental for American, 7s. 6d. for fine Cinquantina, 5s. 11d. for Argentine, 5s. 7d. for Russian (rather poor Caucasian), 5s. 10d. for Roumanian and Bulgarian. No Canadian, South African, or Indian was on offer.

Pulse.—Buyers came forward with increased freedom as the cold continued, and at the end of the month a thoroughly good retail business was passing. It seems not unlikely that the spring sowing of beans and peas would be profitable, as these staples are among the few against which the pressure of imports is diminishing. Prices made included 36s. per 532 lb. for fine heavy English beans, 35s. for Maple peas, 33s. 6d. for Dun peas, 34s. for Chinese peas, 39s. for white Canadian peas in London. At Liverpool, Russian peas from Odessa were a feature at 6s. 10d. per cental.

Oil Seeds.—Argentina in February shipped 948,000 qrs. of linseed, so that the buyers had the best of the market, and were able to secure seed at a material decline before the month closed. The weakness of Argentine shippers, however, surprised a good many. It had not been thought that under 40s. would be taken even to clear large cargoes. India offers to ship her new crop in May at 42s., but it can scarcely be said that the hands of Argentine sellers have been forced. Cottonseed, owing to good shipments from Egypt, fell 7s. 6d. per ton on the month, and closed at £7 12s. 6d. The fall in the price of oil seeds is welcome to farmers, who every year use more in the form of cake for fattening stock.

Farm Seeds.—Large quantities of inferior quality red cloverseed have been put on sale, and "prices to clear" have ranged from 30s. to 40s. per cwt. only. The best English has made about 65s., while very good Chilian has arrived on sale at 55s. per cwt. Good cocksfoot is in request, especially heavy seed, 22 to 24 lb. to the bushel. Inferior cocksfoot seldom pays to use. There is also a good demand for *Festuca pratensis*, but it bears so great a resemblance to the seed of common perennial ryegrass that it is nearly always wisest to buy through one of the recognised seed firms.

Minor Staples.—Rice (Bassein) at 7s. per cwt., and rice meal and bran at 5s. to 6s. per cwt., according to fineness of grist, attract attention, and there is also a good sale of cornflour (maize flour) and maize meal at 8s. to 9s. per cwt. for the former and 6s. to 7s. for the latter. The use of carob (locust bean) meal at 7s. per cwt. is increasing, and deservedly, for the food-fruit of this Eastern tree is not only wholesome in itself, but a good appetiser. The price is not at all high, even as a food. The wintry weather in February helped the sale of oatmeal, which made from 24s. for Irish and Canadian, mostly sold per 240 lb. sack, to 38s. for the finest Scotch, a sack of which weighs 280 lb.

THE LIVE AND DEAD MEAT TRADE IN FEBRUARY.

A. T. MATTHEWS.

Fat Cattle.—The trade, taken as a whole, has maintained a very firm tone throughout the month, with only small fluctuations in values. There has been an apparent tendency on the part of farmers to sell as quickly as possible at current rates, and this has frequently augmented supplies of cattle of second quality. When, however, we compare the condition of the stock sent to the Metropolitan market during the last few weeks with that prevailing last autumn, we find a remarkable contrast, and its great superiority is reflected in the prices there realised in comparison with those of the best country markets. The position in this respect has, in fact, been reversed, and instead of being one of the very lowest for Shorthorns, as it was for many weeks during the autumn months, Islington has been quite in the front rank, and on one occasion at least during the past month it stood highest of all the English markets.

At Islington, on the 1st, although business was not quite so brisk as it had been in the end of January, prices were practically unchanged, Shorthorns of first quality still realising 7½d. per lb. The country markets showed more weakness, and reductions of 1d. to 4d. per 14 lb. stone were recorded at Basingstoke, Hull, Ipswich, Leicester, Newport, Peterborough, and Shrewsbury. Against these only Dorchester, Newcastle, and Wellington showed an advance. The next week was an uneventful one in the cattle-trade, and very little change was made in quotations. London was firm, with an occasional advance in exceptional cases, but country markets were scarcely so dear, though quotations were only slightly altered. Leeds advanced 2d. per 14 lb. and Leicester 1d., but Dorchester declined 2d., Wakefield 2d., Wellington 4d. per stone, and Darlington 3d. and Wolverhampton 1s. per live cwt. At Islington, on the 15th, there was an excellent show of Norfolk-fed Shorthorns, a large proportion of which were de-horned. There were also a few useful Devons and Polled Scots, but no Herefords or Welsh Runts worth mentioning. At this time of year Islington is essentially a Shorthorn market, though a large portion of the supply is of Irish origin. Trade was firm, and a rather strenuous attempt on the part of the buyers for the dead meat market to keep down prices failed, and prices were ultimately quoted ½d. per lb. higher, Shorthorns touching 7½d. per lb. In the country markets generally there were rather larger supplies, and trade in some places was inclined to be slow. There was certainly, however, no general decline during the third week, for although Derby, Hull, Peterborough, and Darlington reported a decline, several markets were higher, among them being Bristol, Leicester, Wakefield, Wolverhampton, and York. There was, indeed, rather a wide range of values for best Shorthorn cattle, viz., from 7s. 6d. per 14 lb. at Hull to 8s. 9d. in London. The Scotch markets were, on the average, decidedly stronger, and more or less improvement was manifested at Ayr, Dundee, Elgin, Inverness, and

Perth. At the last Islington market there was again a good muster of cattle of fine quality, but it was noticeable that amongst the 1,210 on offer there was an increased proportion of animals of inferior finish. Trade was slow, and some concession on the part of sellers was found to be necessary to effect a clearance. Scots made 7d. to 7½d. per lb., Devons up to 7½d., and Shorthorns from 6½d. to 7½d. A few second quality Herefords were sold at 6½d., and Shorthorns weighed after sale were found to have realised from 35s. 2d. to 38s. 10d. per live cwt. One lot of twelve Shorthorns was sold to weigh at 36s. per live cwt. The latest reports to hand from country markets show a tendency to weakness. At Leicester, on the 24th, trade was dragging at easier rates, the highest price of Shorthorns at that market being 7d. per lb.

Fat Sheep.—The depression in the value of sheep and mutton is the dark spot in the whole position of agriculture, and all expectations of its early removal have, so far, been falsified. It is now seen that it was not the large supplies of Dutch carcases which kept down prices, as was so generally supposed, nor the abnormal consignments of Scotch mutton which followed. Both these influences have passed, and still there is no sign of immediate recovery. As compared with last year, the prices now ruling are estimated to be from 10s. to 15s. per head lower, and some instances have been given where sheep, purchased in the autumn, have realised several shillings each less than cost, besides the whole expense of their winter keep.

There were 7,050 sheep penned at Islington on the 1st, and all but a very small proportion were of excellent quality. The supply was composed almost entirely of tegs, classed as "Downs" of the Oxfordshire, Hampshire, Norfolk, and Suffolk breeds, and weighing from 70 to 80 lb. dead weight. The demand, however, was painfully slow, and the market could not be nearly cleared. A few pens of very small choice tegs may have fetched 7½d. per lb., but 7½d. was quite the top price for 70 lb. sheep, and 6½d. for those weighing 80 lb. Good half-breds were sold by the hundred at 6½d. per lb., while the best fat ewes sold at 4d. Even Cheviots did not exceed 7½d., which was fully 2d. per lb. less than they were worth a year ago. Things were certainly no better in the country, for no less than sixteen markets reported a downward tendency, more or less pronounced. Basingstoke declined ½d. per lb., Bristol ¼d., Dorchester ¼d., Peterborough ¼d., and Salford ¼d. The highest price of first quality Downs was 8½d. at Dorchester and Derby, and the lowest 7d. at Hereford and Ipswich. There was rather more disposition to buy shown at Islington on the 8th, and, there being a decrease in numbers of 2,000, the market was about cleared. Still prices were no higher, except for Cheviots, which advanced ½d. per lb. At nearly all markets a similar state of things prevailed in the week following, nominal values remaining generally unchanged. Shrewsbury and Wellington advanced ½d. per lb. and Wolverhampton ¼d., but Ipswich declined ¼d., and Derby and Leicester ¼d. per lb. The top price quoted that week for best Downs was 8d., except at Dorchester, where it was 8½d. Chichester, Derby, Salford, and Wolverhampton were all quoted up to 8d., but 7½d. was the more general, while the lowest was 7d. at Hereford and Ipswich.

On the 15th the third week opened with a decidedly more cheerful market at Islington, and it was hoped that the turning point was reached. The 5,850 sheep on offer were readily cleared at ½d. per lb.

advance, making the top price of Downs $7\frac{1}{2}$ d. per lb. This lead was followed in several country markets, and $\frac{1}{2}$ d. per lb. more money was obtained at Newcastle and York, while Bristol, Hereford, Ipswich, and Leicester all advanced $\frac{1}{2}$ d. The trade was also better at four leading Scotch markets. Against this improvement there must be set a further slight decline at Peterborough, Shrewsbury, Wellington, and Wolverhampton. The minimum values touched in January at a few markets were, however, levelled up, and $7\frac{1}{2}$ d. was the lowest quotation for the class of sheep which we are taking as our example, viz., prime Downs of small weight.

Perhaps the above-mentioned rally at London and other places was the cause of the increased supply at Islington on the 22nd. The hopes of senders were, however, again disappointed, and once more the market fell back into a lifeless condition; a large number were left unsold, prices declined to their old level, and the end of the month found the sheep trade still in a state of depression which is almost unprecedented.

Fat Lambs.—The lamb trade has fully shared in the heavy fall of values, and the consumptive demand has been very small. The cold weather has assisted in making matters worse in this respect, and fine half-bred Dorsets have repeatedly failed to find buyers at Islington at 8d. per lb. dead weight. At Leicester, Wakefield, and a few other places lambs have been quoted as high as 1s. and even 1s. 2d. per lb., but in the southern markets, such as Bristol and Exeter, they have been exceedingly cheap.

Veal Calves.—There has been a good demand for veal calves of good quality all the month, and the moderate supplies on offer have made good prices, though varying considerably at different markets. The London trade has been almost nominal. During the first week 9d. per lb. was given at Preston, 9d. at Ashford, and 8 $\frac{1}{2}$ d. at Newcastle and Derby, but at Bristol and Exeter the price was only 7 $\frac{1}{2}$ d. The second week showed undiminished values, and 9 $\frac{1}{2}$ d. per lb. was realised at Leicester, the demand continuing good to the end.

Fat Pigs.—Although there has been no great or sudden advance in values, the trade has held a firm tone throughout the month, and prices have gradually hardened at nearly all markets.

Carcase Beef.—The chief feature of the early part of the month was the arrival of large supplies of Danish sides in London and other great centres. It has frequently happened that a rising market for beef in England has been checked by a sudden influx of Danish, which ceases when prices again become low. These supplies were very heavy in the beginning of the month, and the effect was felt at the Central market, where values at once suffered a fall of $\frac{1}{2}$ d. per lb. for Scotch, $\frac{1}{2}$ d. for English, $\frac{1}{2}$ d. for Deptford killed, and $\frac{1}{2}$ d. for American chilled. Prices, however, remained steady at this decline for the next week, the following being those for first quality:—Scotch sides 6 $\frac{1}{2}$ d., English 5 $\frac{1}{2}$ d., port killed 5 $\frac{1}{2}$ d., and chilled American, hind-quarters 6 $\frac{1}{2}$ d. and fore-quarters 3 $\frac{1}{2}$ d. The best Danish ox beef fetched 4 $\frac{1}{2}$ d. to 5 $\frac{1}{2}$ d. per lb. The third week brought a firm trade and a small advance in all the best classes of beef, chilled and frozen remaining practically unchanged. Values were well maintained in the last week, although there were liberal supplies from Scotland. Butchers complain that present wholesale prices leave them no margin for profit on the first qualities of beef.

Carcase Mutton.—The trade in carcass mutton has closely followed that for live sheep, and requires but little comment. The month began with another fall, and the finest Scotch sheep sold slowly at 6d. per lb., small tongs $6\frac{1}{4}d.$, and English tongs at $5\frac{1}{4}d.$. These were extreme prices, and very fine quality Scotch sheep were easily obtainable at $5\frac{1}{4}d.$. There was a better trade in the second week, and home killed mutton advanced $\frac{1}{2}d.$ per lb. Frozen mutton was lower, and the finest New Zealand only fetched $3\frac{3}{4}d.$ per lb., and best Argentine $3\frac{1}{4}d.$. The third week was a dull one, and prices ruled about the same, but they returned once more to the lowest point during the last week. It was admitted that large quantities of mutton have lately had to be sold at far lower prices than any quoted in order to make a clearance. During the last few days some fine small lambs from the Wallingford district have come in, and these have made 1s. per lb.

Veal and Pork.—The trade for veal has ruled fair during February for both English and Dutch of best quality, which has generally fetched $7\frac{1}{2}d.$ per lb., but much has been sold at 6d. and under. On the 24th the writer witnessed the sale of five legs of Dutch at $3\frac{1}{4}d.$ per lb. The pork trade has ruled very steady at $5\frac{1}{2}d.$ to $6\frac{1}{2}d.$ per lb. with little fluctuation.

THE PROVISION TRADE IN FEBRUARY.

HEDLEY STEVENS.

Bacon.—February is notoriously one of the worst months of the twelve in the bacon trade, and this year has done nothing to retrieve its reputation. This may be due, to a considerable extent, to the fact that prices are on a fairly high level, Danish sides being about 10s. per cwt. above the figure of 1908. But the absence of any really healthy demand is the true source of the trouble, and in view of this it is somewhat surprising that there has been no big break in the market. Prices certainly have receded during the month, both in Irish and Danish selections, but not to the extent that was confidently expected. The cold weather has helped holders, who, knowing what the finished article has cost to produce, have resisted very successfully the efforts of buyers to force prices down. The strength of the American markets has also had to be reckoned with. Hogs there are fully two dollars higher than for the same period last year, and with a good home demand the Chicago packer has been disinclined to ship his goods here. C.i.f. prices are higher than spot values, and forward sales are practically at a standstill. It is said that prices are bound to be higher in the near future, and if stocks are any criterion, this prediction looks like being justified. The supply of stout and overweight meat is in excess of the demand, but this is being gradually rectified.

Canadian bacon is still in small supply, and is likely to continue so. English hogs are quoted at 9s. 6d. per score in the west, which is an advance of 3d. on last month's prices. They are showing shorter, and still higher rates are looked for.

Cheese.—It is difficult to write cheerfully of the cheese trade, either

from the importer's or consumer's point of view. At a time when trade throughout the country is dragging and there is much unemployment, the careful housewife, remembering the days when good cheese was retailed at 6d. per lb., grudges parting with her money for this article if she can obtain a cheaper substitute. As a consequence, the merchant finds the demand restricted, and to do business has to sacrifice any hope of clearing his stock at a profit. The reserve of cheese in Canada is not large, and is held for full prices by men who profess confidence in the market advancing. The stocks in Montreal are certainly less than last year, and very much less than two years ago, but the make in New Zealand is reported to be good, and if this is so it may upset the shrewdest calculations, although the quality of some of the early arrivals is said to be not entirely satisfactory.

Of course, February is recognised as being a slow month for the wholesale trade, but this year it has been exceptionally so. During the last few days of January the merchants experienced a fairly good demand, and the grocers seem to have enough to go on with for a few weeks, but they will probably have to make purchases again soon, and March may have a better tale to tell. As regards spot prices of Canadian, they became a little firmer during the first week of the month, since when they have dragged along with very little variation. Dutch cheese has been in request, and prices have hardened, but the trade in English makes has been slow and disappointing.

Butter.—The month opened with prices steady for all selections, but during the week ending February 13th Colonial butter dropped fully 2s. in value, buyers operating very cautiously and simply filling their immediate requirements. During the following week prices dropped another 2s., with no improvement in the demand. With the large arrivals from New Zealand and Australia, London agents tried hard to push sales, but with little success, merchants in the country continuing a "hand to mouth" policy. The quality of some Australian and New Zealand butter arriving has not been quite up to the standard of previous years. This applies especially to Victorian, some lots of which have been very irregular. Prices in United States and Canada continue to rule very high, and consignments of States creameries have been shipped back to New York, where they have found a ready market owing to the scarcity and high price of all grades in America.

Eggs.—There has been a good demand throughout the month, with no accumulation of stocks, arrivals generally being very small. In spite of this, however, prices have shown a considerable drop from the end of January, when they were abnormally high.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND
in the Month of February, 1909.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK:—				
Cattle:—	per stone.*	per stone.*	per cwt.†	per cwt.†
Polled Scots ...	8 5	7 10	39 0	35 9
Herefords ...	8 3	7 7	—	—
Shorthorns ...	8 2	7 5	37 11	35 1
Devons ...	8 3	7 8	—	—
Veal Calves ...	per lb.* d.	per lb.* d.	per lb.* d.	per lb.* d.
	8 ½	7 ½	8 ¼	6 ¾
Sheep:—				
Downs ...	7 ½	6 ½	—	—
Longwools ...	7	6 ½	—	—
Cheviots ...	7 ¼	7 ¼	7 ¼	6 ½
Blackfaced ...	7 ½	6 ½	6 ½	6
Cross-breds ...	7 ½	6 ½	7 ¼	6 ½
Pigs:—	per stone.*	per stone.*	per stone.*	per stone.*
Bacon Pigs ...	s. d. 6 4	s. d. 5 10	s. d. 6 6	s. d. 5 11
Porkers ...	6 11	6 5	7 3	6 5
LEAN STOCK:—	per head.	per head.	per head.	per head.
Milking Cows:—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	21 9	18 2	21 18	17 9
" —Calvers ...	21 11	18 1	19 17	17 7
Other Breeds—In Milk ...	17 13	13 19	18 17	15 18
" —Calvers ...	13 10	12 9	19 6	16 5
Calves for Rearing ...	2 6	1 14	2 15	2 1
Store Cattle:—				
Shorthorns—Yearlings ...	10 11	8 18	9 12	7 18
" —Two-year-olds ...	14 0	12 11	14 8	12 3
" —Three-year-olds ...	16 16	15 5	17 7	13 10
Polled Scots—Two-year-olds	—	—	15 17	13 1
Herefords— "	14 18	13 10	—	—
Devons— "	15 6	13 12	—	—
Store Sheep:—				
Hoggs, Hoggets, Tegs, and Lambs—	s. d.	s. d.	s. d.	s. d.
Downs or Longwools ...	39 9	32 7	—	—
Scotch Cross-breds ...	—	—	26 6	22 1
Store Pigs:—				
Under 4 months ...	23 10	17 7	20 9	16 3

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in
ENGLAND and SCOTLAND in the Month of February, 1909.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birming-	Man-	Liver-	Glas-	Edin-
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	54 0	54 0	53 6	—	58 6*	53 6*
	2nd	53 0	50 0	49 6	—	52 6*	48 0*
Cow and Bull ...	1st	40 0	47 0	45 0	42 0	43 6	42 6
	2nd	31 6	40 0	40 0	37 6	37 6	35 6
U.S.A. and Canadian :—							
Port Killed ...	1st	55 0	53 6	51 6	53 6	52 0	—
	2nd	50 0	46 6	48 0	49 0	48 0	—
Argentine Frozen—							
Hind Quarters ...	1st	30 6	31 6	30 6	30 6	31 6	31 6
Fore " ...	1st	26 6	27 0	25 6	25 6	27 0	27 0
Argentine Chilled—							
Hind Quarters ...	1st	43 6	45 0	43 6	43 0	49 0	45 0
Fore " ...	1st	32 0	32 6	32 0	32 0	32 6	32 0
American Chilled—							
Hind Quarters—	1st	57 6	57 6	56 0	56 0	55 6	58 6
Fore , , ...	1st	37 6	39 6	37 6	37 6	37 6	40 0
VEAL :—							
British	1st	69 0	68 0	73 0	79 6	—	—
	2nd	64 0	56 6	64 0	74 6	—	—
Foreign	1st	70 0	—	—	—	—	66 0
MUTTON :—							
Scotch	1st	59 6	61 0	65 6	66 0	62 0	51 6
	2nd	53 6	48 0	60 6	61 0	43 0	44 6
English	1st	55 0	61 0	60 6	60 6	—	—
	2nd	50 0	50 0	56 0	56 0	—	—
U.S.A. and Canadian—							
Port killed ...	1st	—	—	46 6	46 6	—	—
Argentine Frozen ...	1st	30 6	30 0	30 0	29 0	—	30 6
Australian " ...	1st	26 6	28 6	27 6	27 0	—	—
New Zealand " ...	1st	34 0	—	—	—	—	—
LAMB :—							
British	1st	93 6	104 0	—	—	—	—
	2nd	74 6	88 6	—	—	—	—
New Zealand ...	1st	57 0	52 6	50 0	49 6	55 0	—
Australian ...	1st	42 6	46 6	38 0	38 6	—	—
Argentine ...	1st	44 6	41 0	37 6	38 0	37 6	45 6
PORK :—							
British	1st	57 0	60 6	62 0	63 0	54 0	56 6
	2nd	49 6	56 0	56 0	58 6	52 0	48 0
Foreign	1st	56 6	55 6	56 0	56 0	—	46 6

Scotch.

AVERAGE PRICES of British Corn per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1907, 1908 and 1909.

Weeks ended (in 1909).	WHEAT.				BARLEY.				OATS.			
	1907.	1908.	1909.	1907.	1908.	1909.	1907.	1908.	1909.	1907.	1908.	1909.
Jan. 2 ...	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
" 9 ...	26 0	35 1	32 0	23 11	26 9	26 7	17 3	18 4	17 4	18 4	17 3	17 5
" 16 ...	26 1	35 2	32 9	24 2	26 9	26 11	17 4	18 3	17 5	18 3	17 5	17 5
" 23 ...	26 1	35 5	32 8	24 1	27 1	27 1	17 5	18 5	17 8	18 5	17 8	17 8
" 30 ...	26 2	35 6	33 2	24 5	26 11	27 3	17 5	18 5	17 9	18 4	17 9	17 9
Feb. 6 ...	26 3	35 0	33 0	24 4	26 11	27 6	17 5	18 4	17 9	18 3	17 10	17 10
" 13 ...	26 6	34 3	33 4	24 5	26 9	27 7	17 7	18 0	17 11	18 0	17 11	17 11
" 20 ...	26 7	33 1	33 3	24 1	26 9	27 8	17 7	18 0	17 11	18 0	17 11	18 0
" 27 ...	26 10	32 6	34 1	24 2	26 5	27 11	17 9	17 8	18 0	17 9	17 8	18 0
Mar. 6 ...	26 9	30 11	34 5	24 2	26 3	28 0	17 9	17 8	18 2	17 9	17 8	18 2
" 13 ...	26 8	30 5	34 10	23 11	26 1	27 11	17 11	17 10	18 0	17 10	17 10	18 0
" 20 ...	26 10	31 3	31 2	24 2	26 0	26 2	18 0	17 1	17 11	18 1	17 11	17 11
" 27 ...	26 8	31 4	31 3	23 9	25 10	18 2	18 2	17 10	18 3	17 9	17 9	17 9
Apl. 3 ...	26 9	31 3	31 2	24 3	25 5	18 3	18 3	17 9	18 6	17 7	17 7	17 7
" 10 ...	26 8	31 2	31 1	23 9	25 10	18 7	18 7	17 7	18 9	17 9	17 9	17 9
" 17 ...	26 8	30 11	31 3	23 3	26 1	18 7	18 7	17 7	18 9	17 9	17 9	17 9
" 24 ...	26 10	30 10	31 3	23 3	25 5	19 3	19 3	18 0	19 3	18 0	18 0	18 0
May 1 ...	27 0	31 6	31 6	23 6	25 8	19 7	19 7	18 4	19 7	18 4	18 4	18 4
" 8 ...	27 6	32 4	32 4	24 0	25 5	20 1	20 1	18 7	20 1	18 7	18 7	18 7
" 15 ...	28 4	33 1	33 1	23 10	24 9	20 5	20 5	18 10	20 8	18 8	18 8	18 8
" 22 ...	29 7	33 8	33 8	24 3	25 9	20 9	20 9	18 5	20 8	18 5	18 5	18 5
" 29 ...	31 4	34 5	35 5	24 0	24 6	20 8	20 8	18 7	20 8	18 7	18 7	18 7
June 5 ...	32 0	33 1	33 1	24 7	25 10	20 7	20 7	18 4	20 7	18 4	18 4	18 4
" 12 ...	31 10	32 7	32 7	24 7	24 5	20 11	20 11	18 4	20 11	18 4	18 4	18 4
" 19 ...	31 4	32 0	32 0	24 11	24 2	20 9	20 9	18 5	20 8	18 5	18 5	18 5
" 26 ...	31 2	31 5	31 5	24 6	24 0	20 8	20 8	18 7	20 8	18 7	18 7	18 7
July 3 ...	31 3	30 11	30 11	24 8	23 11	20 11	20 11	18 7	20 11	18 7	18 7	18 7
" 10 ...	32 0	30 5	30 5	24 10	24 4	20 11	20 11	18 5	21 1	18 5	18 5	18 5
" 17 ...	32 6	30 7	30 7	24 6	23 1	21 1	21 1	18 6	21 2	18 7	18 7	18 7
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" 21 ...	33 7	31 2	31 2	25 0	24 5	19 8	19 8	17 10	18 11	17 1	17 1	17 1
" 28 ...	33 10	30 10	30 10	24 6	24 5	18 11	18 11	17 1	18 11	17 1	17 1	17 1
Sept. 4 ...	31 11	30 10	30 10	24 2	25 11	17 7	17 7	17 3	17 6	17 6	17 6	17 6
" 11 ...	31 4	31 5	31 5	24 4	25 11	17 6	17 6	17 3	17 8	17 2	17 2	17 2
" 18 ...	31 5	31 7	31 7	25 0	26 0	17 9	17 9	17 6	17 11	17 0	17 0	17 0
" 25 ...	31 8	31 5	31 5	25 3	26 8	17 9	17 9	17 6	18 0	17 0	17 0	17 0
Oct. 2 ...	32 6	31 7	31 7	25 5	26 11	17 9	17 9	17 6	17 11	17 0	17 0	17 0
" 9 ...	33 3	31 5	31 5	25 9	27 5	18 0	18 0	17 6	18 7	16 11	16 11	16 11
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" 18 ...	34 9	32 9	32 9	27 1	26 9	18 3	18 3	17 2	18 0	17 2	17 2	17 2
" 25 ...	34 6	32 2	32 2	26 10	26 8	18 0	18 0	17 2	18 0	17 2	17 2	17 2

NOTE.—Returns of purchase by weight or weighed measure are converted to Imperial Bushels at the following rates: Wheat, 60 lbs.; Barley, 50 lbs.; Oats, 39 lbs. per Imperial Bushel.

AVERAGE PRICES of Wheat, Barley, and Oats per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

	WHEAT.		BARLEY.		OATS.	
	1908.	1909.	1908.	1909.	1908.	1909.
France : January	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
	39 5	38 0	26 0	25 10	18 2	20 1
February	39 3	38 8	25 11	26 2	20 3	20 4
Paris : January	39 0	39 3	26 2	23 3	19 4	20 5
February	39 4	39 8	26 2	23 3	19 8	20 11
Germany : January	46 6	42 8	30 3	29 9	23 3	21 11
Berlin : January	47 4	44 11	—	—	23 9	23 3
Breslau : January	46 6	40 5	{ 31 3 (brewing) 27 9 (other)}	{ 30 8 (brewing) 26 2 (other)}	21 4	20 8
Belgium : December	1907. 34 5	1908. 32 4	1907. 26 II	1908. 25 7	1907. 21 6	1908. 19 7

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets.

AVERAGE PRICES of British Wheat, Barley, and Oats at certain Markets during the Month of February, 1908 and 1909.

	WHEAT.		BARLEY.		OATS.	
	1908.	1909.	1908.	1909.	1908.	1909.
London...	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
...	33 10	35 0	26 0	26 3	18 9	18 11
Norwich	33 3	33 3	26 9	27 1	18 1	17 9
Peterborough	31 11	33 4	25 7	26 7	17 4	17 7
Lincoln...	32 2	33 8	26 11	28 6	17 6	17 10
Doncaster	32 4	33 7	26 4	29 2	18 1	17 9
Salisbury	32 7	34 4	25 10	28 7	17 3	17 6

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of February, 1909.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Bristol.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
BUTTER :—			s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
British ...	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
	15 3	14 0	15 6	14 0	—	—	15 0	—
Irish Creamery ...	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
„ Factory	113 0	110 6	109 6	107 0	—	—	—	—
Danish ...	103 0	99 6	106 6	97 0	103 6	96 6	—	—
Russian ...	117 0	115 0	—	—	117 6	114 6	116 0	—
Canadian ...	104 0	100 6	106 0	99 0	105 0	100 0	101 0	95 0
New Zealand ...	110 0	108 0	113 6	110 0	111 0	108 0	111 6	—
Australian ...	107 6	104 0	111 6	105 0	107 0	104 6	110 0	106 6
CHEESE :—								
British—								
Cheddar ...	77 0	64 6	74 0	62 0	76 0	70 0	70 0	66 6
120 lb.	120 lb.	120 lb.	—	—	120 lb.	120 lb.	—	—
Cheshire ...	84 0	75 6	—	—	82 6	74 0	—	—
per cwt.	per cwt.	per cwt.	—	—	per cwt.	per cwt.	—	—
Canadian ...	63 6	62 0	63 0	61 0	64 0	61 6	64 0	62 6
BACON :—								
Irish ...	64 6	59 6	65 6	56 0	61 6	55 0	63 0	59 0
Canadian ...	55 6	54 0	56 6	53 0	53 6	51 0	55 6	53 0
HAMS :—								
Cumberland ...	99 0	84 6	—	—	—	—	—	—
Irish ...	98 0	89 6	—	—	—	—	88 0	76 0
American ... (long cut)	50 6	48 6	49 0	46 0	48 0	44 6	49 0	47 6
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British ...	13 6	12 6	11 8	—	—	11 6	12 4	10 4
Irish ...	13 3	11 8	12 0	11 4	12 3	—	12 11	10 11
Danish ...	13 0	11 7	—	—	—	—	—	—
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Langworthy ...	70 0	60 0	70 0	62 6	81 6	75 0	50 6	46 6
Scottish								
Triumphs ...	60 0	50 0	62 6	52 6	41 6	36 6	—	—
Up-to-Date ...	60 0	50 0	62 6	50 0	41 6	36 6	39 6	35 0
HAY :—								
Clover Meadow ..	84 6	71 0	72 6	—	85 0	62 6	65 0	60 0
Meadow ..	70 0	55 6	65 0	—	—	—	55 0	50 0

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER OF OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	FEBRUARY.		TWO MONTHS ENDED FEBRUARY.	
	1909.	1908.	1909.	1908.
Swine-Fever: —				
Outbreaks	105	96	263	251
Swine Slaughtered as diseased or exposed to infection ...	1,017	379	2,060	1,051
Anthrax: —				
Outbreaks	114	90	253	225
Animals attacked	177	124	358	324
Foot-and-Mouth Disease: —				
Outbreaks	—	3	—	3
Animals attacked	—	112	—	112
Glanders (including Farcy): —				
Outbreaks	52	58	101	142
Animals attacked	162	209	267	501
Sheep-Scab: —				
Outbreaks	123	187	313	478

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	FEBRUARY.		TWO MONTHS ENDED FEBRUARY.	
	1909.	1908.	1909.	1908.
Swine-Fever: —				
Outbreaks	2	12	5	29
Swine Slaughtered as diseased or exposed to infection ...	1	304	13	651
Anthrax: —				
Outbreaks	—	1	1	2
Animals attacked	—	1	1	2
Glanders (including Farcy): —				
Outbreaks	—	—	—	—
Animals attacked	—	—	—	—
Sheep-Scab: —				
Outbreaks	80	85	165	192

SELECTED CONTENTS OF PERIODICALS.

Transactions of the Royal Scottish Arboricultural Society. xxii. 1.

The Forest Resources of the United Kingdom. Report of Address to the Society by Sir Herbert Maxwell, Bart.; A Scheme for Establishing a National Industry of Forestry, (i) Some Criticisms by Mr. R. C. Munro Ferguson, M.P., (ii) Correspondent's Reply; The Loganburn Smoke Case, *A. Lauder*; Demonstration Forests for Scotland, *F. L. C. Cowley-Brown*.

Journal of the Royal Society of Arts.

Jan. 29, 1909 :—The Part Played by Vermin in the Spread of Disease, *J. Cantlie*.

Feb. 12, 1909 :—The Production of Wheat in the British Empire, *A. E. Humphries*.

Journal of the Land Agents' Society. viii. 2.

Valuation for Mortgage on Agricultural Estates, *L. G. Dease*.

Transactions of the Surveyors' Institution. Vol. xli.

Parts ii. and iv. :—A Paper on the Administrative Aspects of Sewage Disposal, *H. T. Scoble*.

Part iii. :—A Paper on Agricultural Co-operation in connection with Small Holdings, *J. A. Eggar*.

Part v. :—A Paper on the Ordnance Survey, *Col. Sir D. A. Johnston*.

Journal of the Department of Agriculture and Technical Instruction for Ireland, January, 1909.

Tobacco Growing in Ireland, *G. N. Keller*; Protection of Woodlands in Ireland, *A. C. Forbes*; Early Potato Growing, *M. G. Wallace*.

Bulletin Mensuel de l'Office de Renseignements Agricoles, November, 1908.

L'Agriculture en Wurtemberg, *G. Ferrand*.

Revue Economique internationale. Vol. iv. No. 3.

Petites tenures en Angleterre, *F. Impey*; La Culture Maraîchère aux Environs de Paris, *M. Lair*.

Annual Report of the Bureau of Animal Industry, U.S. Dept. of Agric., 1907.

Report of the Chief of the Bureau, 1906–7, *A. D. Melvin*; The preservation of our native types of horses, *G. M. Rommel*; The effect of certain diseases and conditions of cattle upon the milk supply, *J. R. Mohler*; Some important factors in the production of sanitary milk, *E. H. Webster*; The classification of milk, *A. D. Melvin*; Milk and its products as carriers of tuberculous infection, *E. C. Schroeder*; The tuberculin test: Its method of application, value, and reliability, *J. R. Mohler*; The eradication of tuberculosis in cattle, *A. D. Melvin*; Tuberculosis of hogs: Its cause and suppression, *J. R. Mohler* and *H. J. Washburn*; Embryonal adenosarcoma of the kidney in swine, *L. Enos Day*; Dermal mycosis associated with sarcoptic mange in horses, *A. D. Melvin* and *J. R. Mohler*; A study of the methods of canning meats, with reference to the proper disposal of defective cans, *C. N. McBryde*; The de-horning of cattle, *R. W. Hickman*; The dairy industry in the South: Introduction, *B. H. Rawl*; Southern markets for dairy products, *D. Stuart*; The milk supply for southern cities, *G. M. Whitaker*; Why dairying is undeveloped in the South, *B. H. Rawl*; The care and testing of Camembert cheese, *C. Thom*; The development of the export trade in pure-bred live stock, *G. M. Rommel*; The poultry work of the Bureau of Animal Industry, *R. R. Slocum*.

ADDITIONS TO THE LIBRARY.

[NOTE.—The receipt of annual publications of foreign agricultural and other departments, experiment stations and societies is not noted in the monthly list of additions to the Library, but a list of all such publications, which are regularly received, will be given from time to time.]

Great Britain—

Fradd, Meredith.—*The Management of Rabbits.* (80 pp.) London : Upcott Gill, 1908. 1s. net.

Edinburgh and East of Scotland College of Agriculture. Bull. xvi.—*The Composition of Brewers' and Distillers' Grains.* (21 pp.) Edinburgh, 1909.

Fay, C. R.—*Co-operation at Home and Abroad.* (403 pp.) London : P. S. King, 1908. 10s. 6d. net.

Williams, W. M. J.—*The King's Revenue, being a handbook to the taxes and the public revenue.* (221 pp.) London : P. S. King, 1908. 6s. net.

Crafer, A.—“*Lloyd's*” *Poultry Book.* (46 pp.) London : “*Lloyd's Weekly News*” Office, 1909. 3d.

Nussey, H. and Cockerell, O. J.—*A French Garden in England.* (160 pp.) London : Stead's Publishing House, 1909. 1s. net.

“*One and All*” *Garden Books.* *Lawns*, by W. J. Stevens. (20 pp.); *One and All Gardening.* (156 pp.) London : Agricultural and Horticultural Association, n.d. 1d. and 2d. respectively.

Aberdeen and North of Scotland College of Agriculture.—Report (i) on Turnip Experiments, 1907; (ii) on Rotation Experiment at Midtown, Cornhill. (16 pp.) Report on Sprouting or Boxing Seed Potatoes. (7 pp.) Aberdeen, 1909.

University College of Wales, Aberystwyth.—Report on Experiments, 1907–8 : The Feeding of Cattle; the Feeding of Pigs; Variations in the Quantity and Quality of Milk; the Manuring of Meadow Land. (28 pp.) Aberystwyth.

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Memoirs of the Geological Survey.—The Water Supply of Bedfordshire and Northamptonshire, from Underground Sources. (230 pp.); The Water Supply of Kent. (399 pp.) The Geology of the Country near Oban and Dalmally. (184 pp.) London : Stanford, 1908–9. 4s. 6d., 8s. 6d., and 2s. 6d. respectively.

Australia—

Handbook of South Australia.—Issued by the Government of South Australia. (324 pp.) Adelaide, 1908.

Canada—

Correspondence and Papers, including Financial Statement, relating to Seed Grain Distribution of 1908 in the Provinces of Saskatchewan and Alberta. (208 pp.) Ottawa, 1909.

France—

Preux, L.—*La Force et la Lumière à la Ferme et dans la petite Industrie.* (184 pp.) Paris : Vuibert et Nony, 1908.

Coupin, H.—*Technique Microscopique appliquée à l'Etude des Végétaux.* (254 pp.)

Malpeaux, L.—*La Betterave à Sucre.* (128 pp.) Paris : Hachette, 1908. 1fr. 50.

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Supplement
TO
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THE FOOD
OF SOME
BRITISH BIRDS.

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INTRODUCTION.

Representations have been made to the Board of Agriculture and Fisheries during recent years respecting the losses caused by birds to the farmers and fruit growers of this country, and the Board have repeatedly been urged to take strong measures to reduce the nuisance. On the other hand, many correspondents, among whom are included some scientific authorities, have pointed out the benefits conferred by birds in keeping down the number of insect and other pests that occasion such an enormous annual loss. Experience has shown that many of the writers of the first class have based their complaints on a faulty observation of facts, and in spite of the number of statements made on the subject it remains abundantly clear that there is very little really accurate knowledge about the food and habits of birds. The Board, therefore, have come to the conclusion that before any legislative action could be recommended, a much fuller and more scientific inquiry would need to be made on the lines of the work that has been carried on in North America and in certain countries of the Continent of Europe.

As a preliminary contribution to the inquiry, they have been fortunate enough to obtain a valuable report from Mr. Newstead, of Liverpool University, which is printed in the present Supplement to the *Journal*. Mr. Newstead, whose name is well-known in connection with entomological research, has conducted the investigations reported on here through a period of twenty years, and has materially contributed to the sum of knowledge on the subject. But valuable as the work is, it is clear that a great deal more requires to be done, especially as regards the food of nestlings and of adult birds in the summer.

A Committee of the British Association for the Advancement of Science was appointed in the autumn of 1908 to carry out

investigations on the same subject, and the Board have decided to work in conjunction with this Committee. Two points require special investigation. It is necessary to examine and tabulate the contents of the crops of certain birds in each month of the year, so that an opinion may be formed of the benefits or injuries caused by birds at all seasons. Secondly, it is necessary that some estimate should be made of the available food in the district where the birds were feeding when killed, in order that it may be decided whether the foods discovered in the crops were selected from choice or from necessity. Mr. Newstead's report throws a good deal of light on the first of these questions, but many more workers in the field are required before the latter question can be decided. It is hoped that later reports will include some information on this point.

Board of Agriculture and Fisheries,
4, Whitehall Place, S.W.
10th December, 1908.

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THE FOOD OF SOME BRITISH BIRDS.

ROBERT NEWSTEAD, M.Sc., A.L.S., ETC.

School of Tropical Medicine, The University, Liverpool.

The records of the materials upon which this memoir has been largely built are based upon 871 post-mortem examinations of the stomach contents and the "pellets" or "castings" of 128 species of British birds. In the case of the Starling and a few other birds, these have been supplemented by a number of definite observations made in the field, which brings up the total to considerably over 1,100 records. From an entomological standpoint these records are, it is believed, the most extensive that have yet been compiled in this country, and as such should form a valuable contribution to our knowledge of the food of British birds, especially in relation to agriculture and horticulture.

In the majority of cases the material was collected in the county of Chester, so that the details concerning the dietary of the birds must be considered as more or less of a local character; but how far local conditions may modify the food of our British birds it is impossible to say, as our knowledge of the subject is at present very meagre. It is to be regretted that in many instances the records of the food contents of the stomachs of a great number of the birds dealt with in this work are so few in number, often limited to one or two. With the rarer birds this was naturally unavoidable, and rightly so; but the series of records of some of the commoner birds might, with very little trouble, have been greatly extended, especially in regard to the grain and seed eating species. In many instances, too, there is a great or almost total absence of spring and summer records. Taken in the aggregate, however, these records show clearly what an important part the majority of our British birds play in checking the increase and lessening the ravages of many of the pests of the garden and field.

Some of the earlier records date back to the year 1879, but the greater portion of the work has been conducted during the last twenty years or so. With the exception of a relatively few species of birds no special effort was made to obtain the material. In nearly all cases the birds were presented to the Grosvenor Museum, Chester, and as they passed through my hands for preservation post-mortem examinations were made and the stomach contents carefully examined and tabulated. I wish, however, to express my thanks* to Col. B. G. Davies Cooke, Colomendy, Mold; to Messrs. T. A. Coward and Sidney G. Cummings; and also to my brothers Alfred and Arthur Newstead for their kindness in providing me with material which has proved of considerable interest and value.

The exact nature of the food found in all instances has been, as far as possible, fully catalogued, so that it may be available for any further investigations which may be conducted in this country. The sex, date of capture, and the exact locality are given in nearly all cases, and additional information is furnished where it has been thought desirable or of any economic importance.

The food of the nestling young is a phase of the subject which has received but little attention. It is my impression, however, that with more extended observations we shall find that not only are the young of the various species of insectivorous birds fed upon soft-bodied insects, especially caterpillars, but that the same kind of food is carried to the young of many of the finches and other hard-billed birds, which in their adult stages subsist very largely on a seed and grain diet. The most valuable information obtained on this subject is that which is embodied in the Field Notes on the Starling (Nos. 397a-405), from which we gather that during a period of seventeen hours no less than 269 insects of the injurious group were fed to the young, against 4 only that belonged to the beneficial group. To my mind this is a most convincing proof of the great services which this bird renders to agriculture in Cheshire and elsewhere. The difficulties attending such exact observations in the field are, however, very great; and it is rarely that

* I beg also to acknowledge the kind assistance rendered by my colleague, Dr. J. W. W. Stephens, for reading through the final proof of this paper during my absence in Jamaica.—R. N.

one can conceal oneself sufficiently close to a nest for the identification of the food brought in to the young to be rendered possible. Much can be done by the aid of good binoculars, but no very exact particulars can be obtained in this way. However, the enthusiast may, with a little ingenuity and plenty of patience, be able to add much to our knowledge of the food of the nestling young without taking the life of the birds.

The insect food found in the stomachs and "pellets" is classified under the following heads:—

- (1) Insects belonging to the injurious group.
- (2) Insects belonging to the beneficial group.
- (3) Insects belonging to the indifferent group.

In group 1 are included the caterpillars or larvæ of all kinds of moths, weevils (*Rhyncophora*), bark and wood-boring beetles, ants and gall-making insects, wasps, sawfly larvæ, plant lice, scale insects, &c.

In group 2 are included the ground beetles (*Geodephaga*), ichneumon flies, predaceous larvæ, some aquatic insects (*Notonecta*, &c.), lady-bird beetles (*Coccinellidæ*), &c.

In group 3, all the dung-feeding beetles (*Scarabaeidæ*) and a miscellaneous selection of other innoxious insects which do not fall within the pale of the other groups.

Representatives of all these groups occurred sometimes in the same bird. It is quite obvious, however, that many of the insects included under the first two headings may be referable to group 3, as the difficulty of determining the specific characters from small fragments of insects is so great that it was often impossible to do more than refer such material to the families or sub-families to which it belonged. However this may be, we find on tabulating the insects included in the injurious group that out of an approximate total of 525* records the number of instances in which the insects were identified as being injurious to various crops was 203. The remaining records are doubtful, but as they are referable to families or genera which include many well-known insect pests, it has been thought desirable that they should be retained in this division.

One has also experienced the same difficulty in classifying the insects which are placed in group 2. In this division there

* Field-records not included.

is a total of some 102 records, of which number about 50 generic or specific identifications were possible.

In a few instances it was possible to count the actual number of insects that were present in the birds' crops, but in the majority of cases it was impossible to do so. It follows, therefore, that the percentage of insects must be determined by the frequency with which they were met with, and not by the aggregate number of specimens. By this means we find that insects occurred in about 41 per cent. of the total number of post-mortem records and pellets. If we eliminate the finches, the hawks and owls, ducks, geese, divers and the oceanic birds from this total, we find that the insects forming the whole or part of the dietary of the remaining birds amounts to between 70 and 75 per cent.; and it is important to note that those insects which are included in the injurious group vastly outnumber those which may be considered beneficial, and are almost twice as numerous as the beneficial and the innoxious groups combined.

The insects chiefly found in the stomach contents, &c., putting them in the order of frequency of occurrence, are as follows :—

- (1) Weevils (Rhynchophora).
- (2) Dung beetles (Scarabaeidæ).
- (3) Two-winged flies, chiefly Tipulidæ or "crane flies" and their larvæ, ("leather jackets").
- (4) Ground beetles (Geodephaga).
- (5) Moth larvæ, chiefly surface caterpillars (Lepidoptera).
- (6) Click beetles and their larvæ ("wire worms") (Elateridæ).
- (7) Scale insects (Coccidæ) and plant lice (Aphidæ).
- (8) Earwigs (Forficulidæ).
- (9) Flea beetles, &c. (Halticina).
Rove beetles (Staphylinidæ).
- Lady-bird beetles (Coccinellidæ).
- Chafers* (*Melolontha vulgaris*, &c.).
Bees, ants and ichneumons (Hymenoptera).
- (10) Sawfly larvæ (Tenthredinidæ).

* The chafers (*Melolontha*, *Rhizotrogus*, *Phyllopertha*) would, if examinations were made during the season when these beetles are plentiful, take a much higher rank, as all previous records go to prove that they are edible species and form part of the food at least of the larger birds.

We may now proceed to discuss the insects which are included under the above headings, but they will be dealt with under their respective orders.

BEES, ANTS AND ICHNEUMON FLIES, &C. (HYMENOPTERA).

Humble Bees (*Bombus* spp.).—These were found in negligible numbers, there being but 11 records. The Blackbird, Great Tit, Red-backed Shrike and Spotted Flycatcher are responsible for these. It is quite certain that these insects do not represent the principal supply of insect food.

Hive Bee (*Apis mellifica*).—These insects are eaten both by the Blue Tit and the Great Tit, but I have not been able to ascertain if these birds capture living examples ; though, if one may rely implicitly upon the statements given in the Journals devoted to apiculture in this country, there should be no doubt in the matter. Further particulars regarding this subject will be found on pp. 31-3.

Wasps (*Vespa* spp.).—The remains of two species were found in the stomach of a Spotted Flycatcher, but whether this bird feeds habitually upon these pests it is impossible to say. Seeing that the remains of a Humble Bee were found in another individual it is highly probable that these insects may form part of its regular food supply. Further proof is needed, however.

Ants (Formicidæ).—These were found in very few instances ; but, in point of individuals, they occurred in large numbers in the stomachs of the Green Woodpecker and the Common Sandpiper.

Gooseberry Sawfly (*Nematus ribesii*).—The stomachs of three Cuckoos, Nos. 459-461, were found distended with the destructive larvæ of this insect. Judging from the total absence of these larvæ from the stomachs of other insectivorous birds one may infer that they are generally distasteful. That the Cuckoo feeds very largely upon them and other allied species is, I think, conclusively proved by these records. Unfortunately this bird is comparatively scarce and not of very confiding habits ; but this is not to be wondered at seeing that it is so often shot when it ventures into our fruit gardens and orchards.

Gall-making Insects (Cynipidæ).—Tits (Paridæ) feed upon these insects, and, judging by the number of individuals found

in some of the stomachs and the large percentage of galls which are sometimes drilled by these birds, one may infer that they are eaten in considerable numbers.

Ichneumon Flies (Ichneumonidae).—Though there are nine separate records of these insects, the total number of individuals do not exceed eighteen specimens, of which curiously enough ten were cocoons.

BEETLES (COLEOPTERA).

Wire Worms and the parent insects, the "Click Beetles" or "Skipjacks" (Elateridae).—The frequent occurrence of these insects, more especially of the parent beetles, is very marked, and goes a long way to prove that they form part of the regular food supply of various kinds of birds. There are, altogether, no less than 22 individual records, and, in some instances, the number found in a single stomach was very large. This was particularly noticeable in the case of the Meadow Pipit (No. 179), the Jay (Nos. 319 and 327), the Jackdaw (Nos. 351-352) and the Black-headed Gull (No. 816).

Ground Beetles (Geodephaga).—These insects were found in a large number of instances (between 40 and 50), though never in very great numbers in a single stomach. They are eaten by birds belonging to widely separated families; but their larvae were not found in the course of these investigations. Broadly speaking, the whole group may be considered beneficial, as they attack living insects and other forms of animal life; though a few species have been known to eat growing corn and certain species of *Pterostichus* and *Harpalus* are claimed to be destructive to ripe strawberries. All the members of this division of the beetles have, however, been classed under group 2, but it is quite obvious that a few of the records would be more correctly placed with the injurious insects.

Dung-feeding Beetles (Scarabaeidae).—These insects occurred in a very large number of instances, and one gathers that they are eaten by birds belonging to many different families. They are of little or no economic importance, though they may in some small measure assist in breaking up the dung of the domesticated animals in fields and pastures.

Weevils (Rhynchophora).—From the frequency with which these beetles were met with one may safely infer that they are

more keenly sought after by all insect-eating birds than possibly any other group of insects. Unfortunately the remains were so frequently found in a fragmentary condition that identification was, in many instances, quite impossible ; for this reason and the fact that many species are injurious to cultivated plants they are all included under group I. The destructive genera *Anthonomus*, *Apion*, *Sitones*, and *Otiorhynchus* occur among the records ; and the Marsh Tit (No. 153) is responsible for the capture of some specimens of the Apple Blossom Weevil (*Anthonomus pomorum*) which is so destructive to fruit blossoms in many parts of Cheshire and elsewhere. Members of the other genera are likewise destructive by "girdling" the twigs of the rose and removing the bark from the raspberry, destroying young crops of beans and peas, clover heads, and other things.

Flea Beetles (Halticidae).—Many examples of one of the Turnip Flea Beetles (*Phyllotreta nemorum*) were found in the Blackcap (No. 54), which the bird may have taken from either field or garden crops. There are also some interesting records of the occurrence of this pest and its still more destructive relative (*P. undulata*) in six examples of the Tree-creeper. Judging by the data and the habits of the bird the insects were probably secured from the crevices or from behind the semi-detached bark of trees or posts or similar habitat.

Bark-boring Beetles (Scolytidae*).—Judging from these records it would seem that the larvæ of these beetles are eaten chiefly by Woodpeckers. It is very doubtful if any other British bird could extract them from their burrows. See also Field Note on the Lesser-spotted Woodpecker (p. 63).

MOTHS AND THEIR LARVÆ (LEPIDOPTERA).

Surface Caterpillars (Noctuæ).—The most noteworthy records of these insects were obtained from the five young Rooks (Nos. 358–360, 363, 366) and the nestling young of the Starling (Nos. 398–402). Reference has already been made to the insect dietary of the latter (p. 2), and the summary of the Field Notes (p. 58) shows very clearly what an enormous number of caterpillars are eaten by the nestling young. As to the Rook

* In a communication to the Rev. Canon Fowler (Address read before the Ent. Soc., London, 15th January, 1902), I inadvertently placed these insects with the Rhynchophora in the order of frequency of occurrence.—R. N.

one gathers that the five examples referred to contained between them no less than 213 surface-feeding caterpillars. Apart from these we find also that a number of other birds feed upon moth larvæ.

*Caterpillars of the Winter Moth (*Cheimatobia brumata*) and the Mottled Umber Moth (*Hybernia defoliaria*).*—There are altogether nine authentic instances of these insects being eaten by birds. In the first record (No. 70) the stomach of the Willow Wren was filled with the larvæ of the first-named insect, though the number of individuals was not counted. The most important observation in reference to the destruction of these pests is that which is embodied in the Field Notes on the Great Tit (No. 151) and the Starling (Nos. 399–403). There is a record of at least one which was found in a young Chaffinch and a striking record of over 120 larvæ of the Winter Moth in the stomach of a Jay (No. 322).

*Caterpillars of the Magpie Moth (*Abraxas grossulariata*).*—These insects are undoubtedly distasteful to nearly all insect-eating birds, but they were found in the stomachs of three adult Cuckoos (Nos. 457–459).

Moths and Moth Chrysalids.—The latter were rarely found, and, in the instance of the young Starlings (No. 403) many have been rejected. Moths appear to be eaten chiefly by those birds which capture their food upon the wing such as Swallows, Martins, Swifts and Nightjars, though there is one record of the occurrence of the remains of these insects in the stomach of a young Chaffinch (No. 259).

FLIES OR TWO-WINGED INSECTS (DIPTERA).

This extensive order as a whole is not, apparently, preyed upon by birds to the same marked extent that beetles are, though we shall probably find as our researches are extended that many birds which habitually take food upon the wing, such as Swallows and Martins, feed extensively upon them. The Crane Flies and their larvæ, however, represent a considerable portion of the food of several kinds of birds.

"Leather Jackets" and Crane Flies (Tipulidae).—This memoir includes no less than 46 individual records of the occurrence of these insects in the stomachs and "castings" of various birds; and they were frequently represented by an

enormous number of individuals, as many as 400 being found in a pellet of the Black-headed Gull. The larvæ or "Leather Jackets" are also eaten in considerable numbers, especially by Rooks, Starlings, and occasionally also by other birds (Lapwing, Curlew). Beside the post-mortem records some important Field Notes are also given in connection with the Rook (p. 53) and the Black-headed Gull (p. 85), so that we have abundant evidence that these insects are destroyed by birds in large numbers and possibly to a greater extent than any other pest of the farm.

Green-bottle Flies, &c. (*Muscidæ, Bibionidæ, &c.*).—These insects do not appear to be eaten by birds to any great extent ; but it may be interesting to note that the species, *Lucilia sericata*, whose maggots or larvæ are so harmful to sheep, occurred in the stomachs of three Willow Wrens ; and there is one record of the Blue-bottle Fly (*Calliphora erythrocephala*) from the Swallow. The maggots or larval stages of these insects were rarely found ; but there is an interesting find of the larvæ and pupæ of the Holly Fly (*Phytomyza aquifoliae*) in a Blue Tit (No. 114). Representatives of the family *Bibionidæ* were found in a few instances, but these are of little economic importance. Of the beneficial species there is but a single record of the larvæ of a Syrphid Fly (No. 464).

PLANT BUGS, PLANT LICE, SCALE INSECTS, &c. (HEMIPTERA).

The larger members of this order, more especially the true plant bugs (*Gymnocerata*), appear to be generally distasteful to birds, as there is but one record of these insects from a Nuthatch (No. 160) taken in Gloucestershire. The predaceous Water Bug or "Water Boatman" (*Notonecta glauca*), on the other hand, has been found in several instances, though, as a rule, in small numbers only. In captivity these bugs are most voracious feeders, and will attack and destroy young fish of various kinds when placed together in aquaria ; but whether this habit obtains to the same extent in open waters is uncertain.

American Blight (*Schizoneura lanigera*).—Great numbers of this pest were found in the Golden-crested Wren (Nos. 57, 58), and this bird has also been actually seen to feed extensively upon it. Enormous numbers were also found in the stomachs

of three Blue Tits (Nos. 116, 117, 121); but, unfortunately, these birds were at the same time guilty of injuring pears.

Plant Lice (Aphidæ).—These occurred in eight of the post-mortem examinations; and some of the specimens were referable to the genus *Lachnus*.

Scale Insects (Coccidæ).—One finds from long and continued observation in the field that immense numbers of these insects are eaten by the various members of the family Paridæ or Tits. Everywhere in the late autumn and winter the colonies of these insects found infesting ash, apple, and other trees are attacked by these birds, and in some instances from 50 to 70 per cent. are destroyed. The post-mortem records, of which there are no less than nineteen, also afford abundant proof that great numbers of scale insects are eaten by Tits. The species which are usually taken are the Ash-bark Scale (*Chionaspis salicis*), the Mussel Scale (*Mytilaspis pomorum*), and the Pit-making Oak Scale (*Asterolecanium quercicola*,* Bouché). See also Field Notes, No. 125.

CADDIS-FLIES, DRAGON FLIES (NEUROPTERA).

There are a few records of Caddis-worms (Phryganeidæ), all of which were found in the stomachs of aquatic birds: the Dipper, Sandpipers, Water Rail, and Grebe. There is but one record of a Dragon Fly (No. 328); and it is very doubtful if these predaceous insects are eaten to any great extent.

EARWIGS (ORTHOPTERA).

Although so extremely numerous, the common earwig (*Forficula auricularia*) does not appear to be eaten generally in large numbers, though the Green Woodpecker (No. 431) and the Whimbrel (No. 806) contained many examples. These insects were found in the stomachs of twelve birds, of which the following is a list:—Thrush, Whinchat, Redbreast, Great Tit, Nuthatch, Chaffinch, Starling and Woodcock, in addition to the two species to which reference has already been made.

ANIMALS OTHER THAN INSECTS.

Spiders and their Allies (Acarina).—These animals occurred in very few instances and never in any great numbers. It would

* I have decided to retain Bouché's name and sink Ratzburg's *variolosum* as a synonym.—R.N.

seem therefore that they are not eaten by birds to any marked extent.

Centipedes.—Found in a single instance only, so that one may infer that they are rarely eaten by birds.

Woodlice.—Not found in the stomach contents or pellets ; but a Starling was tempted to carry one to its young (see p. 61). These animals are very probably distasteful, though toads feed upon them to some extent both in captivity and in a wild state.

Snails and Slugs (Mollusca).—Small land snails are eaten by many species of birds, but there were relatively few slugs found in the course of this investigation, which may be due to the few examinations of the stomachs of those birds which are credited with feeding upon these animals. The most noteworthy record is that of the Tawny Owl (No. 501), in the stomach of which several grey slugs were found.

Earthworms.—These were met with in very few instances, though it is a well-known fact that these animals form a large proportion of the food of Thrushes, Starlings, and other birds. They are so rapidly digested that little or no trace of them may be found even in those birds which habitually feed upon them.

Fish.—The observations made on the fish-eating birds are so few that comment is scarcely necessary, and all the more so, seeing that in many instances it was impossible to identify the species owing to the nature of the remains ; but some of the records show that birds which subsist very largely on a fish diet also occasionally eat insects.

Frogs.—Found in three instances : in a Bittern (No. 711), in a Sparrow Hawk (No. 598), and in a Kestrel (No. 626), but there is nothing new in these records.

Birds.—Many of the smaller birds, such as the Pipits, Skylark, Finches, Warblers, Thrushes, &c., fall a prey to the Hawks and Owls ; but the only one found to contain the remains of a game bird was the Common Buzzard (No. 581). The Peregrine, the Sparrow Hawk, and the Merlin feed upon birds to a greater extent than possibly any other species, but all birds of prey feed to some extent upon their feathered relatives.

Birds' Eggs.—These were found in four instances only. Once in the stomach of a Raven (No. 374), in which there could be no doubt that the whole egg of a Grouse had been eaten ;

fragments of the egg shell of a Pheasant in the stomach of a Jay (No. 322); and portions of the egg of a Meadow Pipit in the Cuckoo (No. 459). In the course of a long experience in the field one has frequently found eggs bearing unmistakable signs of having been "sucked," and in all probability by birds; but as stoats* and mice are sometimes guilty of the same offence, one cannot lay the blame entirely upon birds which may have acquired a taste for such delicacies.

Field Voles, Mice, &c.—The summaries given at the end of the post-mortem records of the various birds of prey furnish abundant evidence of the usefulness of some of the Hawks and Owls in destroying these vermin. Reference need not be made to the unceasing persecution which the Owls and harmless Hawks receive at the hands of gamekeepers; but one feels bound to say that there is also a ruthless and wanton destruction of these birds by those who, very largely, benefit indirectly by their habits, and to whom the Wild Birds Protection Act is a mere cipher.

VEGETABLE FOOD.

Having discussed the subject of this investigation from a zoological standpoint, we may proceed to consider briefly the nature of the vegetable matter which was found in the post-mortem examinations. Attention has already been called to the fact that comparatively few examples of the grain and seed eating birds were examined, so that one is not in a position to add much to the notes which are given in various portions of this work. It may be well to state that the House Sparrow and the Wood Pigeon have been left out of the question altogether, as the former has already received considerable attention at the hands of other investigators, and it is hoped that the latter will form the subject of a separate memoir to be dealt with at a later date. Much could be said with regard to the grain-eating habits of the Rook, but with this species more extended investigations are greatly needed, though the records dealing with the insect dietary of this bird are of economic importance.

Wheat and other Grain.—Grain was found altogether in about

* I once saw a stoat rob a Thrush's nest of its eggs, though I cannot say if this habit is at all general.

77 instances, though for the most part in extremely small or almost negligible quantities. In many instances, too, it had evidently been obtained from the dung of the horse or other animal, and may in such cases have been taken with the Scarabæid Beetles with which it was associated. It is quite evident also that the small birds had obtained theirs either from the rick-yard or from food thrown out to domestic fowls, as it was sometimes found at a season when grain could not otherwise have been obtained. It is common knowledge that many small birds, such as Starlings, Finches, &c., which do not habitually eat grain at other times, will flock to the farm and other dwellings of man where grain is available. Tits will also eat maize during hard weather, but this forms a very small percentage of their diet, and cannot be considered of any economic importance any more than the bread, suet, and coconut which we give to them.

Seeds of Noxious Weeds.—Some of the more important observations on the seeds of various plants which are eaten by birds are embodied in the Field Notes, so that these need not be referred to in this preface. On the whole, however, the information is scanty for reasons already stated. The post-mortem examinations show that the seeds of such common and widely distributed plants as the following are eaten in large quantities : Various species of Knot Grass, Charlock, Self-heal, Nettle, Dock, Milfoil, Sycamore, Carex sp., Goose Grass, Field Brassica. They are given approximately in the order of frequency of occurrence, though much importance cannot be attached to this classification as there are only about 32 records altogether.

Berries.—These occurred in about the same proportion as seeds, and of these the hawthorn predominated. Rowan and holly berries were not found though these are eaten in large numbers by the various members of the Thrush tribe, and there can be little doubt that a larger percentage of these fruits would have been found in the stomachs of these birds had more extensive examinations been made. Our knowledge of this subject is, however, already clear and full, so that there could be little utility in adding such particulars to the notes on those birds which are known to habitually feed upon the fruits of such common shrubs.

Acorns.—Having eliminated the Wood Pigeon from this

paper, it naturally follows that this fruit was found only in relatively small numbers. The Jay, as is well known, feeds largely upon acorns during the winter months. They were found in several instances in the stomachs of these birds.

Beech Masts.—These were not found among the stomach contents of any of the birds which were examined, though it is well known that Bramblings and other birds feed extensively upon them. It may be important to note, however, that the fruit of the beech does not ripen in Cheshire to the same extent that it does in other parts of England, and it often happens that quite 90 per cent. of the "masts" are empty.

Cultivated Fruit.—Some notes on the fruit-eating habits of birds are given in connection with the Field Notes on the Blackbird, Thrush, Starling and the Tits; but, apart from the last-named, there is no evidence resulting from the few stomach examinations which calls for special comment.

Fruit Buds.—See Bullfinch, p. 45, and also the Blue Tit, p. 26.

METHOD OF EXAMINING THE STOMACHS.

With few exceptions the stomachs were examined when fresh, but some were, for unavoidable reasons, preserved in undiluted methylated spirit or 10 per cent. formalin. The best results were obtained from an examination of the material when quite fresh; when the stomachs were preserved in either alcohol or formalin the characteristic colour pattern of soft-bodied insects or other matter had often entirely disappeared, so that specifically the identifications were rendered difficult or altogether impossible.

In some instances it is necessary to divide the stomach into two parts; but, as a rule, the contents may be easily removed by making an incision along the median line on one side only, care being taken not to cut into the stomach contents. The bulk of the food may be removed with a blunt scalpel and the remainder with a small brush and water. With small birds, such as the Tits, the whole of the contents may be washed out with a jet of water. Place the food in a shallow, flat-bottomed, white dish, such as is used for developing photographic plates, and add sufficient water to float the material or to render it sufficiently clear for examination. The material should then be

spread out evenly over the dish and examined with a pocket lens ; for this purpose I prefer a Leitz No. 8, as it takes in a wide field and does not magnify the larger objects beyond recognition. With the larger birds it is often necessary to wash the material in several lots of water, but with the smaller birds this is risky and not to be recommended. As the objects are identified they should be removed and tabulated, and the residue should be subjected to a careful microscopical examination. This is best done by placing a small quantity of the material in a drop of clear water on a glass slide temporarily protected with a covering glass. In many instances it will be found necessary to float out the material on a piece of white blotting or filter paper, and examine when dry under a low power of the microscope. Whenever the insects or other remains are sufficiently well preserved they should be counted. This is often possible with the larger birds, such as Jays, &c., but with the smaller birds the fragments are often so minute as to render this impossible. The relative proportions of the food can, in nearly all cases, be ascertained with some degree of accuracy, and this should be noted as far as possible.

ON THE RELATIVE VALUE OF BRITISH BIRDS IN THEIR RELATION TO AGRICULTURE AND HORTI- CULTURE AND IN OTHER ECONOMIC ASPECTS.

In order to do justice to the subject matter under this heading one ought perhaps to go much further afield than the *facts* which are embodied in this memoir, as there is a considerable amount of evidence available which would add materially to the interest and value of this communication. On the other hand, many of the contributors to the subject of the food of British birds have been much too one-sided in their views, either of praise or abuse ; and a few have taken not the least trouble to verify their own statements. On the whole, therefore, it has been thought desirable to offer this memoir solely as a further contribution to the study of the exact nature of the food of birds, especially in relation to Cheshire, and this has been rigorously adhered to throughout. It is by no means an easy task to group the birds together so that their relative economic value can readily be seen and a standard of comparison

in this respect fixed. This is rendered all the more difficult as there are so few post-mortem records of some of the commoner species. However this may be, one can, fortunately, fall back upon a long practical experience in the field and garden, so that a classification of a more or less definite nature can be given, though the vagaries of birds are so great that it may be found necessary, from time to time, to modify slightly the grouping of the birds which are here included under the following heads:—

(1) *Species which are wholly innoxious and more or less strictly beneficial.*—Mistle Thrush, Fieldfare, Ring Ouzel, Wheatear, Stonechat and Whinchat, Hedge Sparrow or Accentor, Redstart, Whitethroats, Blackcap, Wrens, Warblers, Long-tailed, Coal and Marsh Tits, Nuthatch, Tree Creeper, Wagtails, Pipits, Shrikes, Flycatchers, Swallow, Martins, Swift, Goldfinch, Lesser Redpoll, Reed Bunting, Night-jar or Goatsucker, Hoopoe, Cuckoo, Rails, Crakes, Moorhen, Coot, Plovers (including the Lapwing), Sandpipers, Woodcock, Snipes, Curlew, and Whimbrel. Additional species might be added to this list, such as all the rarer migrants: Bittern, Crane, Nightingale, all the surface feeding Ducks, Geese, Quail, &c. The majority of these are entirely beneficial, and collectively their influence upon cultivated crops cannot be over-estimated. With the purely aquatic or littoral species we may gather that they also destroy seeds, insects, molluscs, and worms, so that as far as they affect agriculture they do so beneficially, and this must be taken into account in all districts where the marsh lands extend to the sea and are used for grazing purposes, as in Cheshire and elsewhere.

(2) *Species which are occasionally injurious but with the balance of utility very largely in their favour.*—Robin, Linnet, Yellowhammer, Corn Bunting, Skylark, Starling, Woodpeckers, Barn, Tawney and Short-eared Owl, Kestrel, Heron and Black-headed Gull (included also under 3).

The Hawfinch may eventually come under this heading, though we need proof of its utility as an insect destroyer during the nesting season.

(3) *Species which act as scavengers in the estuaries though at all times destructive to young fish.*—Herring Gull, Lesser Black-backed Gull, Black-headed Gull and other members of this family.

One can scarcely realise the important part which these birds play in ridding our rivers of the offal and filth which emanate from the sewers, slaughter yards, vessels and a dozen other sources. They need, therefore, the well-merited protection which has been extended to them in Cheshire and elsewhere.

(4) *Species which are generally considered pests of the farm and garden, but with the balance of utility in their favour.*—Song Thrush, Great and Blue Tit, Greenfinch, Chaffinch, and Rook. The two species of Tits might almost come under heading 2, but the injury which they cause to ripe pears in some districts is so marked that on the whole they fall best within this group. A study of the post-mortem records will, however, at once convince the reader of the utility of these birds. I am of the opinion also that the Rook is, on the whole, decidedly beneficial, though quite omnivorous and a great destroyer of grain.

(5) *Species which are generally beneficial from an agricultural point of view, but destructive to game and other birds or their eggs or young.*—Jay, Magpie, Jackdaw, Long-eared Owl, and the Hawks not included in 2 and 6.

(6) *Species which are destructive and doubtfully of any utility.*
—Blackbird, Bullfinch, Sparrow Hawk, Raven.

The first two are an unmitigated nuisance to the fruit grower, and the Sparrow Hawk is of very doubtful benefit, as it preys upon many small birds which are of a useful kind, takes young chickens occasionally from the farm and is a great pest to game preserves. In spite of its depredations there are many wild and almost barren tracts of country where the Raven could be allowed to breed unmolested by the flockmaster, the keeper and the collector of British birds eggs.

(7) *Species which are wholly destructive and useless.*—I would place under this head the Carrion Crow, the House Sparrow and the Wood Pigeon, though the food of the two last named have not been discussed in this paper.

I feel that it would be impossible to close this chapter in more fitting terms than those given by Mr. Charles W. Nash in his able paper on "The Birds of Ontario in relation to Agriculture,"* in which he impresses upon the student the great value of

* Reprint from the *Report of the Farmers' Institutes of Ontario, 1897-8; Ontario Department of Agriculture, Toronto*, p. 30.

the majority of birds :—" A constant war is," he says, " being carried on between the insect world and the vegetable kingdom. The laws of nature would keep the balance about evenly adjusted. But man requires that it should be inclined in favour of the plants he cultivates for his own use. To obtain this end it is necessary that we should carefully protect and encourage all the forces that will work on our side against our insect enemies, and while they are not the only ones, yet the birds are the most important allies we can have in the struggle. We cannot very well increase their number or efficiency by any artificial means, but we can protect them from such of their natural enemies as occur in our own neighbourhood and we can encourage them to remain and breed about our farms and gardens."

POST-MORTEM RECORDS, FIELD NOTES, &c.

BLACKBIRD (*Turdus merula*, Linn.).

1. *Male*; *Ince, Chester*; 6th January, 1894; taken at night.—Practically filled with berries of the hawthorn; remains of a large beetle (*Carabus violaceus*); two No. 6 gunshots taken in lieu of pebbles; angular fragments of brick.

2. *Male*; *Ince, Chester*; 22nd January, 1894.—Almost filled with fruit of the apple; 3 shells of *Helix caperata*.

3. *Male*; *Ince, Chester*; 2nd February, 1895.—Filled with berries of the hawthorn.

4. *Female*; *Ince, Chester*; 6th February, 1895.—Small land shells (1 *Cochlicopa lubrica*, 2 *Zonites nitidulus*); 2 ova of the earthworm.

5. *Male*; *Ince, Chester*; 6th February, 1895.—Fruit of the apple; fragments of a small dark coloured weevil (Curculionidæ).

6. *Female*; *Ince, Chester*; 6th February, 1895.—Garbage from kitchen midden: bread, egg shells, ashes, &c.; a few grains of wheat.

7. *Female*; *Ince, Chester*; 6th February, 1895.—Fruits of the apple and 1 shell of *Helix caperata*.

8. *Female*; *near Chester*; 7th June, 1889.—A few weevils (Curculionidæ) and small dung beetles (Aphodii). Much too fragmentary to enable one to determine them with any degree of certainty.

9, 10. 2 Males; Crickleigh, near Gloucester; August, 1907.—
 (a) Filled with portions of hard unripe pears. (b) Fragments of many weevils (*Otiorhynchus* sp., *Sitones* sp.); 2 species of ants (*Formica fusca* and *Myrmica rubra*); 1 surface caterpillar (Noctuid); remains of the humble bee (*Bombus terrestris*).

11. Male; Cheshire, 16th December, 1890.—Fruit of the hawthorn; 7 small caterpillars (Noctuæ); several small land shells (*Helix* sp.); and minute fragments of beetles (Curculionidae).

12. Female; near Chester; 16th December, 1890.—Almost filled with berries of the hawthorn; one shell of *Helix caperata* and 1 small moth larva.

Summary.—5 contained insects of the injurious group; 2, beneficial group; 2, indifferent group; 4, hawthorn berries; 4, apple and pear; 4, molluscs; 1, worms; 1, grain; 1, garbage.

Field Notes.—Much may be forgiven this bird for its fine song, but it is a malefactor and the most persistent fruit-eater of all the British birds.

SONG THRUSH (*Turdus musicus*, Linn.).

13. Female; Ince, Chester; 6th February, 1895.—Filled with hawthorn berries.

14. Male; Ince, Chester; 6th February, 1895.—Almost filled with apple; 2 Staphylinid beetles (*Staphylinus* ? *politus*).

15. Male; Ince, Chester; 6th February, 1895.—Filled with apple. This may have been obtained from some partly decayed fruit which had probably been thrown away.

16-19. 4 Nestlings*; near Chester; 21st June, 1908.—All four examples had been fed upon earthworms of which there were many fragments, but the stomachs of these birds were almost filled with soil and grass, all of which had evidently been carried in with the worms. The remains of 1 earwig were found in one of them.

20, 20A. ? Sex; Crickleigh, near Gloucester; August, 1901.—These examples contained many maggots (larvæ) of a Muscid fly; many larvæ of small moths; several weevils (*Otiorhynchus*

* All these birds were infested with small tape worms (Taenidae).

and *Sitones*) ; ants (*Formica fusca*, *Myrmica rubra*) ; wire-worms (*Agriotes* sp.) ; land shells (*Cochlicopa lubrica*).

21. ? Sex ; near Chester ; 10th September, 1893.—Filled with the partly digested remains of grey slugs (*Agriolimax agrestis*).

Summary.—3 contained insects of the injurious group ; 1, beneficial group ; 3, molluscs ; 4, worms ; 1, hawthorn berries ; 2, apple.

Field Notes.—Eats large quantities of all kinds of bush fruit, but generally to a much less extent than its near relative the Blackbird. It is common knowledge that the Thrush feeds largely upon snails (*Helix* spp.) and worms.

MISTLE THRUSH (*Turdus viscivorus*, Linn.).

22. Male ; Ince, Chester ; 6th February, 1895.—Hawthorn berries ; fragments of apple. The latter had been obtained from some partly-decayed fruit which had been thrown out as a “scrap.”

23. ? Sex ; near York ; 8th February, 1904—3 berries of ivy ; a few quartz grains.

24. 1 Male, 1 Female ; near Chester ; 12th December, 1894.—Hawthorn berries ; 1 larva of a Geodephagous beetle ; fragments of weevils (Rhyncophora).

Summary.—1 contained insects of the injurious group ; 1, beneficial group ; 2, hawthorn berries ; 1, ivy berries ; 1, apple.

FIELDFARE (*Turdus pilaris*, Linn.).

25. Male ; Aldford, Chester ; 18th April, 1894—2 small earthworms ; remains of 1 weevil (Rhyncophora).

RING OUZEL (*Turdus torquatus*, Linn.).

26, 27. 2 Males ; Cornwall ; first week, November, 1894.—(a) 25 berries of the hawthorn ; (b) 18 berries of the hawthorn.

WHEATEAR (*Saxicola oenanthe* (Linn.).

28. Female ; Cheshire ; September, 1901.—Geodephagous Staphylinid and Rhynchophorus beetles (*Pterostichus* sp., *Philonthus* spp., &c.).

Summary.—Contained examples of both the injurious and beneficial groups of insects.

STONECHAT (*Pratincola rubicola* (Linn.).

29, 30. 1 Male, 1 Female; Colwyn Bay; 20th May, 1890.—Weevils (*Sitones* sp., &c.) predominated in both specimens; 1 example also contained the skin of a moth larva (Noctuid).

31. Male; Cranham, Gloucester; 28th September, 1900.—1 larva of the White Ermine Moth (*Arctia menthrastri*) (in three equal portions) which had been almost completely divested of its irritating hairs; several larvæ of a sawfly; 4 ova of earthworm; 5 small pebbles.

32, 33. 1 Male, 1 Female; near Colwyn Bay; 27th December, 1890.—Filled with equal proportions of fragments of Diptera and Coleoptera (Rhynchophora predominating).

Summary.—4 contained examples of the injurious group of insects; 1, indifferent group; 1, egg of earthworm.

WHINCHAT (*Pratincola rubetra*, Linn.).

34. Male; Prestatyn, North Wales; 16th May, 1894.—Many small spiders; 1 earwig (*Forficula* sp.); 1 weevil (*Otiorrhynchus* sp.); 5 Parnid beetles (*Parnus auriculatus*); some fine sand. (Insects almost perfect.)

Summary.—Insects of the injurious and indifferent groups.

HEDGE SPARROW (*Accentor modularis* (Linn.).

35. Female; Aldford, Cheshire; 4th April, 1894.—A mass of small fragments of Rhynchophorus beetles; 1 larva of Tortricid Moth; small pebbles of quartz and fragments of brick.

36. Female; Aldford, Cheshire; 4th April, 1894.—A mass of small fragments of beetles, including *Helophorus aquaticus* and many small weevils (*Apion* sp., &c.).

37. Male; Aldford, Cheshire; 30th April, 1895.—Chiefly small Rhynchophorus beetles; 4 Scolytid beetles.

Summary.—3 contained insects of the injurious group; 1, beneficial group.

REDBREAST (*Erithacus rubecula* (Linn.).

38, 39. Male and Female; Ince, Chester; 22nd January, 1894.—(a) 1 earwig (*Forficula* sp.); remains of two small Dipterous insects; sand. (b) Fragments of a small Geodéphagous beetle; fragments of a small fly (Diptera); sand.

40. Female ; near Chester ; 24th February, 1894.—4 seeds of the bindweed (*Convolvulus arvensis*) ; numerous fragments of small Geodephagous beetles ; 1 Staphylinid beetle.

41, 42. 2 Females ; near Chester ; 24th February, 1894.—(a) Fragments of Geodephagous beetles ; 1 Staphylinid beetle (*Ocypus* sp.). (b) 2 yellow ants (*Formica flava*).

43. ? Sex ; near Mold ; September, 1904.—1 Gamma Moth (*Plusia gamma*).

44, 45. 2 Males ; Aldford, Chester ; 24th September, 1889.—Both examples contained a large quantity of the remains of Geodephagous beetles (*Bembidium* sp., &c.) and pebbles.

46. Male ; near Chester ; 17th October, 1889.—Skins of several larvæ of Noctuid moths ; pebbles.

Summary.—3 contained examples of the injurious group of insects ; 5, beneficial group ; 3, indifferent group ; 1, seeds of noxious weed.

Field Notes.—The only accusation that I can bring against this little favourite is that it will occasionally eat ripe grapes, and is most persistent in its endeavours to gain access to vineyards when it has once acquired a taste for this fruit. The remedy is a simple one, as the means adopted to exclude wasps will effectually keep out the Redbreast.

REDBREAST (*Ruticilla phoenicurus*, Linn.).

47, 48. 1 Male, 1 Female ; Llangollen ; 19th May, 1894.—(a) Skins of 39 larvæ of Tortricid moth ; 1 weevil (*Phyllobius* sp.). (b) Filled with fragments of a small species of Diptera.

Summary.—1 contained examples of the injurious group of insects ; 1, indifferent group.

WHITETHROAT (*Sylvia cinerea*, Bechstein).

49. Female ; Aldford, Chester ; 30th April, 1894.—Filled with fragments of Dipterous insects (*Bibionidæ*, &c.).

50. Male ; Eaton, Chester ; 30th April, 1895.—Almost filled with Dipterous insects (*Bibionidæ*, *Muscidæ*, &c.) ; 3 beetles (*Halticidæ*).

51. Female ; Aldford, Chester ; 30th April, 1895.—Almost filled with Dipterous insects (*Bibionidæ*, &c.) ; 1 dung beetle (*Aphodius ater*) ; 1 Hymenopterous insect (*Evanidæ*).

52. *Male*; *Eaton, Chester*; *May, 1894*.—Many Dipterous insects (*Bibionidae*, &c.) ; many beetles (1 *Agriotes obscurus*, 2 *Aphodius fimetarius*, several *Phyllobius* sp.) ; 1 ichneumon.

53. *Male*; *Aldford, Chester*; *11th May, 1894*.—Many moth larvæ (Geometers) ; many weevils (all *Phyllobius* spp.).

Summary.—3 contained examples of the injurious group of insects ; 2, beneficial group ; 4, indifferent group.

Field Notes.—4 nearly full-fledged young birds of this species were fed with the caterpillars of a Geometrid moth which were secured by the parent birds, chiefly from hawthorn and willow bushes in the immediate vicinity of the nest.

BLACKCAP (*Sylvia atricapilla*, Linn.).

54. *Male*; *Cheshire*; *30th April, 1893*.—Almost entirely of minute fragments of Coleoptera, including many examples of two species of the Turnip Flea-Beetle (*P. undulata* and ?sp.) ; 1 small Staphylinid beetle, and a rather large black Crabronid wasp.

55. *Male*; *Cheshire*; *30th April, 1894*.—Almost filled with fragments of Diptera, including 5 examples of a species of *Bibio* ; there were remains also of beetles belonging to the Halticidæ, and a small green weevil allied to *Phyllobius*.

56. *Male*; *Cheshire*; *30th April, 1895*.—Chiefly fragments of Diptera ; also many fragments of small ichneumons ; several dung beetles (*Aphodius punctato-sulcatus*) and remains of other allied species.

Summary.—2 contained examples of the injurious group of insects ; 2, beneficial group ; 3, indifferent group.

GOLDEN-CRESTED WREN (*Regulus cristatus*, K. L. Koch).

57, 58. 2 *Males*; *Ince, Chester*; *January, 1891*.—Filled with American blight (*Schizoneura lanigera*).

59. *Female*; *Oakmere, Cheshire*; *22nd January, 1894*.—Stomach almost filled with the remains of a species of *Psylla* ; 1 weevil (*Apion* sp.).

60, 61. 1 *Male*; 1 *Female*; *Oakmere, Cheshire*; *24th February, 1894*.—Minute fragments of Apterous and winged Hymenoptera (small species) ; fragments of beetles ; *Psylla* sp. ; small spiders ; 1 bud scale.

62. *Male*; Cheshire; 20th April, 1894.—Stomach filled with fragments of small flies (Diptera).

Summary.—5 contained insects of the injurious group; 4, the indifferent group; 2, spiders; 1, a bud scale.

Field Notes.—Seen to feed freely upon American blight (*Schizoneura lanigera*), during the autumn and winter months in several gardens in Cheshire. It does not as a rule remain for any length of time on the infested fruit trees, but pays frequent visits during the day, spending the intervals in more secluded spots. I have not seen the bird feeding upon this pest in large isolated orchards, but it is not uncommon in gardens bordering on woods and coppices.

WILLOW-WREN (*Phylloscopus trochilus* (Linn.)

63. *Female*; near Chester; 26th April, 1894.—Filled with plant lice (Aphidæ), mixed with fragments of one small weevil.

64. *Male*; Cheshire; 30th April, 1895.—Entirely of Dipterous flies (Muscidæ, Bibionidæ, &c.).

65. *Female*; Aldford, Chester; 30th April, 1895.—Almost entirely of remains of Dipterous flies; 1 Click beetle (*Agriotes obscurus*), and fragments of other beetles.

66-68. 1 *Female*; 2 *Males*; Aldford, Chester; 30th April, 1895.—All three were filled with the remains of Dipterous insects, chiefly Muscidæ, including several Greenbottle Flies (*Lucilia sericata*, &c.), and one example contained the remains of 2 small weevils.

69. ? *Sex*; Colwyn Bay; 22nd May, 1890.—Many small moth larvæ (Noctuids and Geometers).

70. ? *Sex*; Colwyn Bay; 20th May, 1890.—Filled with the larvæ of the winter moth (*Cheimatobia brumata*, &c.).

71. *Female*; near Chester; 2nd June, 1895.—Stomach filled with small weevils, with 1 *Dromius quadrimaculatus*.

Summary.—9 contained insects of the injurious group; 3, indifferent group.

Field Notes.—I have frequently observed this bird capturing flies from the flowers of the sycamore and lime in many parts of Cheshire; and in the spring so soon as Aphids are common, it is often possible to see this bird searching for these insects on the underside of the newly expanded leaves.

REED-WARBLER. (*Acrocephalus streperus*, (Viellot).

72, 73. 1 Male; 1 Female; Combermere, Cheshire; 4th June, 1895.—Both examples contained remains of Dipterous flies and Chrysomelid beetles (1 *Donacia phragmitidis*, 1 *Donacia* sp.).

Summary.—All are indifferent species of insects.

DIPPER (*Cinclus aquaticus*, (Bechstein).

74. ? Sex; Colwyn Bay; January, 1890.—Numerous remains of Hydradephagous beetles; many pebbles.

75. Male; Colomendy, Mold; 2nd May, 1895.—Entirely of beetles (*Bembidium* spp., *Harpalus* sp., *Hydradephaga* spp.).

76. Male; Colomendy, Mold; 5th May, 1895.—Filled with equal proportions of the Entomostracan, *Daphnia pulex* and larvæ of Caddis flies (Phryganeidæ).

77. ? Sex; Colwyn Bay; 7th June, 1889.—Hydradephagous beetles; larvæ of Caddis flies (Phryganeidæ).

Summary.—3 contained insects of the beneficial group; 3, the indifferent group; 1, crustaceans.

LONG-TAILED TITMOUSE (*Acredula caudata* (Linn.).

78. ? Sex; Colwyn Bay; January, 1890.—Fragments of beetles (chiefly weevils); portions of 2 centipedes.

79. Male; Cheshire; February, 1894.—Many fragments of beetles; a few examples of the pit-making scale (*Astrolecanium quercicola*); fragments of a species of *Psylla*; portions of several small moths (*Tineina*); 2 brown scale insects (*Lecanium* sp. jun.).

80. ? Sex; Cheshire; 16th February, 1898.—Fragments of weevils and other beetles; 3 Tortricid moth larvæ.

81. Male; Cheshire; 22nd February, 1894.—Many fragments of small beetles, chiefly weevils; a few examples of the pit-making oak scale (*Ast. quercicola*); remains of small Hymenopterous insects; portions of 2 small moths.

82. Male; Cheshire; 24th February, 1894.—Fragments of many small beetles (Rhynchophora); a few examples of the pit-making oak scale (*Ast. quercicola*); portions of several small moths (*Tineina*).

Summary.—5 contained insects of the injurious group; 1, indifferent group; 2 centipedes.

COAL-TITMOUSE (*Parus ater*, (Linn.).

83. *Male*; *Aldford, Chester*; *22nd January, 1894*.—1 weevil (Curculionidæ); 1 cocoon of Ichneumon (Hymenoptera); many eggs of a noctuid moth.

84. ? *Sex*; *Aldford, Chester*; *23rd March, 1894*.—Fragments of Hymenopterous insect (? Braconidæ); 1 halticid beetle (? *Thyamis*); portions of 3 bud scales.

85. ? *Sex*; *near Chester*; *2nd June, 1898*.—A ball-like mass of woolly fibres practically filling the whole of the stomach, intermixed with hairs, antennæ and a few other fragments; Dipterous insects (Muscidæ) and the jaws of a moth larva.

86. ? *Sex*; *Chester*; *5th November, 1901*.—Numerous examples of American blight (*Schizoneura lanigera*); 3 half-grown larvæ of the Cabbage moth (*Mamestra brassicae*); fragments of small weevils (Curculionidæ); 2 small hymenopterous insects (Braconidæ); 2 mussel scales (*Mytilaspis pomorum*).

87. ? *Sex*; *near Chester*; *21st November, 1889*.—Filled with fragments of small weevils and other beetles.

Summary.—5 contained insects of injurious group; 1, beneficial group; 3, indifferent group; 1, 3 bud scales; 1, wool.

Field Notes.—88. *Seeds*.—One seen feeding upon the seeds of the marsh thistle (*Cnicus palustris*) at Crickleigh, near Gloucester, August, 1905. At Upwell, Cambs., during winter of 1877–8, this bird fed freely on the carcase of a dead dog, which was suspended from a tree as food for other members of the Paridæ.

BLUE TITMOUSE (*Parus caeruleus*, Linn.).

89, 90. 1 *Male*, 1 *Female*; *Ince, Chester*; *22nd January, 1894*.—Both examples contained many larvæ of Dipterous flies (Muscidæ, &c.); fragments of bud scales.

91. *Female*; *Cheshire*; *24th January, 1900*.—55 specimens of the mussel scale (*M. pomorum*) with about an equal number of wing cases of small weevils (*Apion*, &c.); many fragments of wheat grains.

92. *Male*; *Cheshire*; *24th January, 1900*.—1 mussel scale (*M. pomorum*); quantities of bud scales; fragments of small beetles (weevils, &c.).

93. ? *Sex*; *Aldford, Chester*; *24th January, 1900*.—Filled with fragments of a hard black fungus.

94. Female; Cheshire; 2nd February, 1894.—4 specimens of the mussel scale (*M. pomorum*) ; fragments of bud scales ; fragments of maize.

95. Female; Cheshire; 2nd February, 1894.—Stomach almost filled with the pit-making oak scale (*Ast. quercicola*) ; many examples of the round oak scale (*Aspidiotus zonatus*) ; remains of a few small moths (Tineinæ) ; fragments of small beetles.

96. ? Sex; Ince, Chester; 4th February, 1890.—Fragments of many bud scales of the oak.

97. Female; Eaton, Chester; 7th February, 1900.—A few grains of wheat ; fragments of weevils ; wing of a small Hymenopterous insect (Ichneumonidæ) ; 2 bud scales.

98. Female; Aldford, Chester; 7th February, 1900.—Fragments of maize and wheat ; many bud scales (? beech) ; fragments of weevils.

99. Male; Eaton, Chester; 7th February, 1900.—Chiefly fragments of wheat grains ; several small moth larvae (Noctuids and Geometers).

100. Male; Aldford, Chester; 7th February, 1900.—Filled with fragments of a hard black fungus, mixed with a few fragments of weevils.

101. Male; Aldford, Chester; 7th February, 1900.—Almost filled with fragments of maize ; fragments of 1 weevil ; apple rind.

102. Male; Eaton, Chester; 7th February, 1900.—200 to 300 examples of the pit-making oak scale (*Ast. quercicola*) ; many examples of the round oak scale (*Asp. zonatus*) ; fragments of small weevils ; some vegetable tissues.

103. Male; Eaton, Chester; 7th February, 1900.—36 specimens of the mussel scale (*M. pomorum*) ; 2 pupæ of a small Dipterous insect ; many particles of wheat grains.

104. Male; Eaton, Chester; 7th February, 1900.—53 specimens of the mussel scale (*M. pomorum*) ; many fragments of small beetles ; fragments of wheat grains.

105. Female; Eaton, Chester; 7th February, 1900.—Fragments of several small spiders ; apple rind ; particles of wheat grains ; 1 mussel scale (*M. pomorum*).

106. Female; Eaton, Chester; 7th February, 1900.—Many particles of wheat ; apple rind ; fragments of several small spiders ; 1 mussel scale (*M. pomorum*).

107. Male; *Eaton, Chester*; 7th February, 1900.—Stomach almost filled with particles of a hard black fungus; 1 mussel scale (*M. pomorum*).

108. ? Sex; *Eaton, Chester*; 7th February, 1900.—Stomach almost filled with particles of a hard black fungus; mixed with a few bud scales, particles of wheat grains and 1 mussel scale (*M. pomorum*).

109. Female.; *Eaton, Chester*; 7th February, 1901.—Chiefly fragments of wheat grains; fragments of weevils (Rhynchophora); wing of ichneumon; 2 bud scales.

110. ? Sex; *Aldford, Chester*; 24th February, 1894.—Chiefly fragments of maize; 4 specimens of the mussel scale (*M. pomorum*); vegetable fibres.

111. Female.; *Aldford, Chester*; 24th February, 1894.—Chiefly examples of the pit-making oak scale (*Ast. quercicola*); several bud scales ? of the oak.

112. ? Sex; *Aldford, Chester*; 24th February, 1894.—Chiefly fragments of maize; 4 mussel scale insects (*M. pomorum*); 3 fragments of bud scales.

113. ? Sex; *Cheshire*; 3rd April, 1894.—Chiefly gall making insects (*Cynips kollaris*); many examples of the pit-making oak scale (*Ast. quercicola*); several small moth larvæ (Tortricidae).

114. ? Sex; *Christleton, Chester*; 6th April, 1905.—Many pupæ and 7 larvæ of the Holly Fly (*Phytomyza aquifoliae*).

115. Female; *Aldford, Chester*; 30th April, 1895.—Many bud scales; 2 Geometrid moth larvæ; remains of many plant lice; fragments of beetles (Scolytidæ, Curculionidæ).

116. Male; *Chester*; 12th July, 1898.—Chiefly examples of American blight (*Schizoneura lanigera*); fragments of 2 or 3 beetles (*Halticina*); 3 cocoons of a small ichneumon (length 4 mm.).

117. Male; *Chester*; 12th July, 1898.—Filled with American blight (*Schizoneura lanigera*).

Note.—This and the example recorded above were shot “red-handed at the peas!” but no trace of the fruit of this vegetable was found in the birds.

118. Immature; *Halton, Cheshire*; 4th September, 1901.—About equal proportions of pear fruit and plant lice (*Aphidæ*); fragments of small Hymenoptera and beetles (Scolytidæ). (Shot while destroying pears.)

119. ? Sex; *Halton, Cheshire*; 4th September, 1901.—Stomach half filled with pear fruit; many aphids; 39 mussel scales (*Mytilaspis pomorum*); many small Hymenoptera (Proctotrypidæ); 1 weevil (Otiorrhynchidæ). (Shot while destroying pears.)

120. Immature; *Halton, Cheshire*; 4th September, 1901.—Chiefly pear fruit; many plant lice; fragments of 1 spider; numerous fragments of small Hymenopterous insects; fragments of 1 earwig. (Shot while destroying pears.)

121. ? Sex; *Halton, Cheshire*; 4th September, 1901.—Stomach half filled with pear fruit; over 500 wings and other remains of plant lice and American blight (*Lachnus* sp., *Schizoneura lanigera*). (Shot while destroying pears.)

122. ? Sex; *Halton, Cheshire*; 4th September, 1901.—Stomach half filled with pear fruit; 55 mussel scales (*M. pomorum*); traces of spiders' webs or other fibrous matter. (Shot while destroying pears.)

Summary.—31 contained insects of the injurious group; 3, beneficial group; 7, indifferent group; 3, spiders; 10, wheat; 4, maize; 5, pear; 3, apple rind; 11, bud scales; 2, vegetable matter, undetermined; 4, fungus.

Field Notes.—123. *Fruit.*—In many localities in Cheshire and Norfolk this bird shows a great fondness for ripe pears,* which it destroys by pecking holes in them, usually in the region of the fruit-stalk. This pernicious habit, so far at least as my experience goes, is most marked where the fruit trees are grown in the immediate neighbourhood of woods and copses, though isolated orchards are by no means exempt.

124. *Fruit Buds.*—A single instance of the wanton destruction of the dormant fruit buds of both the apple and pear occurred in a large garden in Cheshire a few years ago; from 50 to 75 per cent. of the buds being destroyed on some of the trees. A most careful examination was made, but I failed to find traces of insects of any kind either in the buds which were left or in those which had been partly destroyed by the birds. I saw the birds engaged in their work of destruction, but, unfortunately, was prevented from securing examples for dissection, so that it is impossible to say whether they had

* This pernicious habit is, I believe, quite general.

eaten any portion of the buds or not. Bud scales are evidently taken by these birds occasionally (see records Nos. 108, 109, 111, &c.) though to a very small extent and these cannot, I think, be looked upon as a source of food supply.

125. *Scale Insects*.—During the winter months scale insects of various kinds are eaten in large numbers as the records abundantly testify; and in the field one finds that the vast colonies of these insects are often considerably reduced by this and the allied species of Tits. The species which are eaten to a marked extent are: (1) The mussel scale of the apple, &c. (*Mytilaspis pomorum*) ; (2) the white scale of the willow and ash (*Chionaspis salicis*) ; (3) the pit-making coccid of the oak (*Asterolecanium quercicola*) ; (4) the young forms of the gooseberry scale (*Lecanium persicae* var. *ribis*) and other allied species of this genus (*L. bituberculatum*, *L. capreae*, &c.) ; (5) the young forms of the cottony cushion scale of the currant (*Pulvinaria vitis* var. *ribesiae*). Colonies of all these insects which had been artificially established in my garden (Chester) for special study, were so persistently robbed that the host plants had eventually to be protected with netting. At the conclusion of my investigations on the bionomics of scale insects* the netting was removed, with the result that 4 and 5 have now (1908) been completely exterminated; the others have survived in small numbers only.

126. *Oak Galls*.—In Cheshire the tenants of the marble gall of the oak (*Cynips kollaris*) are also eagerly sought for during the autumn and winter in some localities, the insects being extracted after considerable labour has been expended in excavating the hard woody structure. Blue Tits will also extract the tenants of the oak leaf gall (*Neuroterus lenticularis*) after the galls have fallen from the trees.

127. *Beech Masts, Chestnuts, &c.*.—In winter they will eat beech masts and sweet chestnuts with avidity, and occasionally also horse chestnuts. They are passionately fond of the seeds of the sunflower, and feed readily on maize (Cheshire and Gloucestershire); and I have seen them feeding upon meat exposed for sale in a butcher's shop at Upwell, Cambs.

128. *Garden Peas*.—Garden peas are said to be destroyed

by these birds, but I have no proof of this. Two examples (Nos. 116, 117) said to have been shot "red-handed" in the act of eating peas had regaled themselves on American blight and some harmless insects.

129. *Hive Bee*.—My brother, who keeps a large apiary in Cheshire, had long been suspicious that the Blue Tit and the Great Tit were feeding upon the bees. Acting on my suggestion, he concealed himself in a large box which he had previously placed quite close to some of the stocks. On the 10th of February, 1907, a rather mild day, several Tits came and fed upon the *dead bees* which were lying on the ground near the "alighting board." The Blue Tit ate its prey on the spot, shaking the insect violently and devouring it piecemeal; the Great Tit invariably carried its prey to an adjacent hedge a few feet away, and, holding the bee in its foot, pulled the insect to pieces. What portions were rejected was not ascertained, but the stings were in all probability removed.* Many bees were coming in and out of the hives during the whole of the time that my brother was watching (one hour), and some were crawling leisurely over and about the alighting board, but he was positively certain that the birds did not take any of these. The bees, though dead, were quite fresh, so that they would be quite as nutritious as freshly caught specimens.

GREAT TITMOUSE (*Parus major*, Linn.).

130. ? Sex; *near Chester*; 22nd January, 1894.—Several apple "pips"; fragments of a rather large Geodephagous beetle.

131. Female; *Aldford, Chester*; 22nd February, 1894.—Filled with grains of wheat.

132. Female; *Aldford, Chester*; 7th February, 1900.—Chiefly fragments of maize and wheat, mixed with a few fragments of Rhynchophorous beetles.

133. Female; *Aldford, Chester*; 7th February, 1900.—Fragments of a few Rhynchophorous beetles; a quantity of apple rind; fragments of bud scales.

* Mr. Alfred Newstead informs me that the stomach of one of these birds was found to be filled with the remains of the hive bee; but although he searched most carefully he failed to find any traces of the stings; all the other parts of the body were represented. I have examined the material and can verify this statement.—R. N.

134. *Male*; Aldford, Chester; 22nd February, 1894.—20 small moth larvæ (Noctuids and Geometrids); 3 small ichneumons (Hymenoptera); 1 land shell (*Vitrina pellucida*); 1 earwig (*Forficula* sp.).

135. *Male*; Christleton, Chester; 23rd March, 1905.—The heads of 3 hive bees (*Apis mellifica*) and various minute fragments of other parts of the body; no stings or any trace of the abdominal segments; fragments of vegetable matter.

136. *Male*; Christleton, Chester; 27th March, 1905.—The heads of 2 worker hive bees (*A. mellifica*), together with fragments of the abdomen, 1 hind wing, and intestinal organs of these insects; 5 young larvæ of a Geometer moth; fragments of small weevil.

137. *Male*; Christleton, Chester; 31st March, 1905.—24 small moth larvæ (Geometers); fragments of 4 small weevils; 1 large moth (*Hybernia* sp.), the wings still attached to thorax.

138. *Female*; Aldford, Chester; April, 1894.—1 moth larva (Geometer); fragments of many weevils (Rhynchophora).

139. *Male*; near Chester; April, 1905.—Portions of the abdomen of a humble bee (*Bombus* sp.); several skins of moth larvæ (small Noctuids).

140. *Male*; Christleton, Chester; 6th April, 1905.—10 moth caterpillars (1 Noctuid, 9 Geometers), averaging about 1 in. in length.

141, 142. 1 *Male*; 1 *Female*; Eaton, Chester; 11th September, 1889.—Filled with fragments of weevils (*Errirrhinus* sp., &c.) in both instances.

143, 144. 1 *Male*; 1 *Female*; Ince, Chester; 24th September, 1889.—Both examples filled with fragments of small weevils and bark-boring beetles (*Orchestes* sp. and *Scolytidae*).

145. *Male*; Christleton, Cheshire; 21st November, 1901.—Many remains of spiders; 4 cocoons of a Hymenopterous insect (Ichneumonidæ); portions of one large Noctuid moth; many Psyllids. Several scale insects (*Aspidiotus* sp.), not indigenous to Britain. Note.—This bird had frequented a conservatory for several days, which will account for the presence of the exotic coccids.

Summary.—13 contained insects of the injurious group; 6 beneficial group; 1, indifferent group; 1, Mollusca; 1, spiders; 2, apple rinds and pips; 2, wheat; 1, maize; 1 bud scales.

Field Notes.—146. *Bees.*—Reference has already been made to this bird's habit of eating hive bees (p. 5), and this habit is confirmed by the post-mortem records Nos. 135, 136. We gather from record No. 139 that it also feeds upon humble bees (*Bombus* sp.). On 12th August, 1903, Mr. T. A. Coward found a number of dead humble bees under a lime tree at Langley, East Cheshire, 12 of which were kindly forwarded to me. The heads of several had been taken off, the stings in all cases removed, and a large hole had been made in the thorax of each example. This was apparently the work of a bird of some kind, and possibly of the Great Tit, but the evidence is of too circumstantial a nature to decide as to whether or not they had been destroyed by this bird.

147. *Larvæ of Coleoptera and Diptera.*—In the autumn it sometimes breaks up fungi (Boleti and Agarics) for the larvæ of Diptera and Coleoptera, &c., which these plants often harbour in great numbers.

148. *Gall Insects.*—It sometimes feeds upon the marble gall insect (*Cynips kollaris*) in the same way as the Blue Tit.

149. *Seeds.*—It feeds freely on beech masts and sweet chestnuts, and occasionally also on horse chestnuts.

150. *Fruit.*—The Great Tit attacks pears in the same way as the Blue Tit, and when it has once acquired a taste for this fruit it becomes equally, if not more, destructive.

151. *Injurious Moth Larvæ.*—The nestlings are fed very largely on moth larvæ. In June, 1908, I watched a pair which had a brood of 8 young in an iron pump in a small rose nursery near Chester. 90 per cent. of the food brought in to the young consisted of the larvæ of Geometrid moths, which were collected chiefly from the damson, apple and oak trees in the immediate neighbourhood of the nest. Those collected from the fruit trees were chiefly those of the winter moth (*C. brumata*) and those from the oak the Mottled Umber Moth (*H. defoliaria*). Usually one caterpillar was brought in to the young on each occasion, and often four visits were made in the course of 5 minutes. If we take the average number of visits at the rate of 24 per hour for 16 hours, representing one working day, this gives us a total of 384 visits per day. And if 20 days are occupied in rearing the young, this gives us a grand total of 7,680 visits to the nest during this period, so that the single

pair of birds would be responsible for the destruction of between 7,000 and 8,000 insects, chiefly caterpillars!

MARSH TITMOUSE (*Parus palustris*, Linn.).

152. Male; Ince, Chester; 24th February, 1894.—Bread, a few quartz pebbles and fragments of brick.

153. Male; Ince, Chester; 22nd March, 1894.—Many small weevils, including examples of the Apple Blossom Weevil (*Anthonomus pomorum*).

154, 155. 1 Male; 1 Female; Delamere, Cheshire; 4th April, 1894.—Both examples filled with small weevils (*Apion* spp., *Orcheses* sp., &c.).

156, 157. 1 Male; 1 Female; Aldford, Chester; 20th April, 1894.—Both examples filled with small Apterous gall-making insects (*Cynipidae*).

Summary.—4 contained insects of the injurious group; 1, bread.

Field Notes.—158. Seeds.—Frequently seen feeding on the seeds of the Marsh Thistle (*Cnicus palustris*) at Crickleigh, Gloucester, August, 1904.

NUTHATCH (*Sitta caesia*, Wolf.).

159. Male; Eaton, Chester; 22nd March, 1894.—Numerous fragments of acorns; remains of two Dipteron insects; 3 weevils.

160. Female; Crickleigh, near Gloucester; August, 1901.—Remains of 3 earwigs (*Forficula* sp.); many small beetles (Scolytidae and Apionidae); fragments of 1 plant bug (Hemiptera).

Summary.—Both contained insects of the injurious and indifferent groups; 1, acorns.

Field Notes.—Feeds during the autumn and winter months upon hazel nuts, seeds of the yew and the Portugal laurel. Norfolk, Gloucestershire, Cheshire, and also in the Wye Valley.

WREN (*Troglodytes parvulus*, K. L. Koch).

Field Notes.—While staying at Witcombe, Gloucester, in the last week of July, 1907, I had a young brood of the Common Wren under close observation during many hours per day for 7 days.

The parent birds began feeding their young at daybreak and continued to do so until dusk, at intervals of only a few minutes between each visit. The old birds did not, as a rule, go far afield for the food, often procuring it from among the various plants under cultivation in the garden near to their nest ; sometimes they visited an adjacent orchard and occasionally they disappeared entirely. On searching the plants for insects in the neighbourhood of the nest I found that two kinds of caterpillars were present in large numbers : the cabbages were swarming with the larvæ of the Cabbage Moth (*Mamestra brassicæ*), and the groundsel with the larvæ of the Cinnabar Moth (*Hipocrita jacobææ*) ; there were the usual colonies of plant lice upon rose, apple and plum ; Daddy-long-legs (*Tipula* spp.) in the orchard ; and everywhere muscid flies of many kinds, &c.

161. By careful watching I found that the food brought in to the young consisted largely of small moth larvæ, chiefly Noctuids, though one could occasionally detect also the long slender body of a Geometér ; numbers of Crane Flies (*Tipula* sp.) were also brought in, but the smaller insects were not determinable. I discovered eventually that the birds often secured the partly-grown larvæ of the Cabbage Moth (*Mamestra brassicæ*) ; and although I could never be quite sure, I am under the impression that they also occasionally fed their young on the *partly grown* larvæ of the Cinnabar Moth. Had they brought in the fully matured larvæ of this insect I could have detected them quite easily, as I was often within a few paces of the old birds, but I could never see the conspicuous yellow and black bands so characteristic of the insect. The question could have been decided with a shot-gun, but I preferred to make experiments. Four days before the youngsters left their nest I impaled some larvæ of *H. Jacobææ* on the end of a thin pointed stick and presented them to the young wrens. One of the birds ate 5 (2, 2 and 1) with evident relish. I then offered 8 more of the larvæ to the other inmates of the nest, and these also were readily swallowed. I then waited for some minutes to satisfy myself that they were not rejected. The experiment was repeated the following day with precisely the same results. On the third succeeding day I offered the birds 2 more of the larvæ, but these were absolutely refused,

and, fearing that further intrusion would cause them to quit their nest prematurely, I left them. Interesting as this record may seem, it does not prove that the wrens fed their young on these nauseous larvæ, though, as they are so distasteful, it is strange that the young birds did not reject them in the first instance.

TREE-CREEPER (*Certhia familiaris*, Linn.).

162. ? Sex; *Oakmere, Cheshire*; 15th January, 1894.—Many Turnip Flea Beetles (*Phyllotreta undulata*); spiders' webs.

163. Male; *Oakmere, Cheshire*; 15th January, 1894.—Many fragments of weevils; 1 *Phyllotreta undulata*; 5 small Lepidopterous larvæ; 1 spider.

164. ? Sex; *Aldford, Chester*; 22nd January, 1894.—Apple pips; 1 Flea Beetle (*Phyllotreta undulata*); 1 Geodephagous beetle; 2 wing cases of a Coccinellid beetle (*Coccinella variabilis*).

165. ? Sex; *near Chester*; 4th February, 1890.—Many fragments of beetles (Curculionidæ).

166. Male; *Aldford, Chester*; 22nd February, 1894.—Many fragments of weevils; 1 *Phyllotreta undulata*; 1 Dipterous larva.

167. ? Sex; *Aldford, Chester*; 22nd February, 1894.—2 *Phyllotreta undulata*; fragments of small weevils; 3 seeds of Knapweed (*Centaurea nigra*).

168. Male; *Aldford, Chester*; 22nd March, 1894.—Almost entirely of fragments of small weevils (Apionidæ, &c.); 1 small cocoon of a species of Ichneumon; small ball of spiders' webs.

169. ? Sex; *Ince, Chester*; 20th June, 1894.—Fragments of weevils (*Apion* spp., &c.); several Flea Beetles (*Phyllotreta nemorum*, *Thyamis* sp.).

Summary.—8 contained insects of the injurious group; 2, beneficial; 3, spiders and their webs; 1, seeds of Knapweed (*C. nigra*).

PIED WAGTAIL (*Motacilla lugubris*, Temmink).

170. ? Sex; *Cheshire*; 7th February, 1900.—Fragments of 2 weevils.

171. Male; *Ince, Chester*; 22nd March, 1894.—Almost entirely of beetles (*Cercyon* spp., *Helophorus aquaticus*, &c.); fragments of 3 Ichneumons (2 species).

172. Female; Aldford, Chester; 22nd March, 1894.—Chiefly beetles (*Notiophilus biguttatus* and a few specimens of *Anchomenus* sp.) ; fragments of cinders and bricks ; vegetable fibres.

173. Male; Aldford, Chester; 22nd March, 1894.—Chiefly beetles (*Helophorus aquaticus*, many ; weevils, a few) ; vegetable fibre ; fragments of cinders and brick.

174. Male; Ince, Chester; 25th April, 1894.—Filled entirely with fragments of Diptera (Bibionidae, &c.).

175. Male; Ince, Chester; April, 1894.—Almost entirely of fragments of Dipterous flies (Bibionidae, &c.).

176. Male; Cheshire; May, 1900.—Fragments of 2 Water Boatmen (*Notonecta glauca*) ; fragments of Geodephagous beetles.

177. Male; Aldford, Chester; 15th June, 1894.—7 moth larvæ (Tortricidae) ; fragments of weevils.

Summary.—2 contained insects of the injurious group ; 3, beneficial group ; 4, indifferent group ; 1, vegetable matter.

Field Notes.—I have nothing of a definite nature to offer in regard to its dietary apart from the records given above ; but anyone who has watched this bird in its various haunts during the summer months must have been struck by its persistent habit of catching small flies either upon the wing or when at rest ; and by the fact that it may frequently be seen among grazing cattle, swiftly chasing any insects which the animals may disturb. So far as one can gather, the insects are relatively small flies belonging to the Diptera,* but whether they attack any of the larger Muscids, which are such pests to cattle in hot weather, I have not been able to ascertain ; there were no traces of the remains of these insects in the examples examined. In winter, when winged insects are scarce, beetles are evidently sought for and probably form the principal food of this bird, and possibly also of the Grey Wagtail.

GREY WAGTAIL (*Motacilla menalope*, Pallas).

178. Male; Ince, Chester; 22nd January, 1894.—Filled with unusually small fragments of beetles (Geodophaga and Rhynchophora).

* A female examined during the month of August, 1908, had its stomach filled with fragments of a small syrphid fly and Muscid larvæ.—R. N.

Summary.—Contained insects of the injurious and beneficial groups.

MEADOW PIPIT (*Anthus pratensis* (Linn.).

179. Female ; *Puffin Island, Anglesey* ; 4th June, 1895.—1 Pill Beetle (*Byrrhus pilula*) ; many Click Beetles (*Athous haemorrhoidalis*) ; 1 Blue-bottle Fly (*Calliphora erythrocephala*).

180-182. 3 Examples from stomach of Merlin (No. 608) ; near *Bala* ; 25th July, 1896.—Fragments of Dipterous insects, plant bugs (Hemiptera) and Ichneumons (Hymenoptera).

Summary.—2 contained insects of the injurious group ; 1, beneficial ; 4, indifferent group.

TREE PIPIT (*Anthus trivialis* (Linn.).

183. Male ; *Aldford, Chester* ; 15th June, 1894.—Many Dipterous flies (Tipulidæ, &c.) ; fragments of beetles (*Hypera nigrorostris* and other weevils, &c.).

Summary.—Contained insects of the injurious and beneficial groups.

ROCK PIPIT (*Anthus obscurus* (Latham)).

184. Male ; *Colwyn Bay* ; 12th January, 1894.—Equal proportions of exceedingly minute fragments of vegetable matter and beetles (Geodephaga and Rhynchophora) ; large grains of sand and a few pebbles.

Summary.—Contained insects of the injurious and beneficial groups.

RED-BACKED SHRIKE (*Lanius collurio*, Linn.).

185. Male ; *Whitchurch, Salop* ; 24th May, 1895.—Remains of humble bee (*Bombus* sp. near *terrestris*) ; fragments of beetle.

186-190. 5 Nestlings ; *Minera, Denbigh* ; June, 1890.—These had been fed extensively upon the rather rare red-tailed humble bee (*Bombus lapponicus*), which occurs very commonly in this district. The lower half of the nest was also lined with the remains of this bee. Two other species of humble bee (*Bombus terrestris* ♀ and *Bombus* sp. ♀) were found impaled by these birds in the immediate neighbourhood of the nest.

191. Fledged young ; *Crickleigh, Gloucester* ; August, 1901.—Remains of "burial beetles" (*Necrophorus humator* and *N. mortuorum*).

Summary.—6 contained insects of the beneficial group; 2, indifferent group.

WAXWING (*Ampelus garrulus*, Linn.).

192. Female; near Whitchurch; 24th December, 1901.—Filled with " hips " or fruit of the wild rose (*Rosa* sp.).

193. Male; Aston, Cheshire; 28th December, 1901.—Fruit of the wild rose (*Rosa* sp.).

SPOTTED FLYCATCHER (*Muscicapa grisola*, Linn.).

194, 195. 1 Male; 1 Female; Oakmere, Cheshire; 21st July, 1890.—Both birds had fed upon a rather large weevil, but the remains were too fragmentary for exact identification.

196. Female; Crickleigh, Gloucester; August, 1908.—Remains of humble bee (*Bombus* sp.); minute fragments of Dipterous insects.

197. Female; Crickleigh, Gloucester; August, 1901.—Remains of 2 wasps (*Vespa vulgaris* and *Vespa* ? sp.); fragments of an ichneumon; 1 blow fly (*Lucilia* ? *sericata*).

Summary.—3 contained insects of the injurious group; 2, beneficial group; 1, indifferent group.

PIED FLYCATCHER (*Muscicapa atricapilla*, Linn.).

198. Male; Eaton, Chester; 17th April, 1894.—74 imperfect wings of Dipterous insects; remains of Staphylinid beetles; many acarids (Oribatidæ). The last-named were in all probability parasitic on the insects.

Summary.—Contained insects of probably all 3 groups, but they were so fragmentary that exact determination was impossible.

SWALLOW* (*Hirundo rustica*, Linn.).

199. Female; Aldford, Chester; 6th July, 1894.—Chiefly Diptera, including 1 blue-bottle (*Calliphora erythrocephala*); remains of 2 weevils (Curculionidæ).

Summary.—Contained insects of the injurious group.

* A number of swallows were seen feeding upon plumed gnats (*Chironomus* sp.) which were flying in clouds over the filter beds at Oswestry, August, 1908.

SAND MARTIN (*Cotile riparia*, Linn.).

200-203. 3 *Males*; 1 *Female*; *Ince, Chester*; 29th May, 1894.—All 4 examples contained a large quantity of fragments of small flies (Diptera); but it was impossible to assign them to any particular group.

HOUSE MARTIN (*Chelidon urbica*, Linn.).

204. *Pellets from nest*; *Ince, Chester*; August, 1902.—Fragments of Diptera; many wing cases of Coccinellid beetles.

205. ? *Sex*; *Ince, Chester*; 5th October, 1901.—Filled with beetles (*Tachyporus* spp., *Aphodius fimetarius*, &c.).

Summary.—1 contained insects of the beneficial group; 2, indifferent group.

Field Notes.—206. *Moths*.—Large Noctuid moths which are put to flight by labourers when haymaking are frequently caught by Swallows and House Martins. The species which usually fall a prey to these birds in this way are: The Yellow Underwings (*Triphaena pronuba* and *T. orbona*), the Heart and Dart (*Agrotis exclamationis*), and occasionally other species.

GREENFINCH (*Ligurinus chloris*, Linn.).

207, 208. 2 *Males*; *near Chester*; 24th February, 1894.—1 contained maize and a few small pieces of cinders; the other was filled with wheat.

209. *Male*; *Aldford, Chester*; 24th February, 1894.—Wheat and fragments of cinders.

210, 211. 2 *Males*; *Aldford, Chester*; 20th and 28th March, 1895.—Seeds of cultivated mustard; many fragments of maize.

212. *Male*; *Aldford, Chester*; 22nd March, 1894.—Fragments of maize; quartz pebbles.

213. *Female*; *Christleton, Chester*; 6th April, 1905.—Wheat, in fragments; particles of cinders.

214, 215. 2 *Examples*; *Prestatyn, Flint*; 30th October, 1904.—Both contained seeds of the charlock (*Brassica Sinapis*).

216. ? *Sex*; *near Chester*; 19th October, 1904.—Fragments of the seeds of the cultivated sunflower.

217. ? *Sex*; *near Chester*; December, 1904.—Seeds of the wild rose (*Rosa canina*).

Summary.—2 contained seeds of noxious weeds; 2, indifferent seeds; 1, mustard; 3, maize; 3, wheat.

Field Notes.—218. *Injury to Seed Crops.*—Feeds extensively upon the seeds of all the Brassica tribe (turnip, radish, mustard, sprouts, &c.), especially when the young plants are just breaking through the soil. So persistent are these birds in their efforts to gain admission to seed beds that I have known them to make their way through a double thickness of ordinary fish-netting, and in the course of 2 or 3 hours destroy almost every embryo plant within the enclosure. This habit was most marked in the neighbourhood of Upwell, Cambs, where in years gone by it was the general custom among horticulturists to lay down poisoned wheat in order to destroy the birds and save the crops. I have noticed the same habit in many localities in Norfolk, Gloucestershire and Cheshire. Fields of freshly sown turnip seed are equally attractive, and it is sometimes necessary to employ a watcher to frighten the birds away; though the injury to such crops is often done in the early morning before the watcher arrives.

219. *Feeds on Charlock.*—In certain districts in Flintshire, where the charlock is abundant and allowed to "seed," large flocks of this and other finches congregate together and feed upon the seeds of this plant. (See also Record No. 214.) In town gardens (Chester and elsewhere) they also feed freely upon the seeds of the sunflower, and in winter will eat the seeds of the wild rose. In the latter case the fruit is opened at the end and the seeds or kernels extracted, and split either longitudinally or transversely; the noise produced being audible at some considerable distance (see also Record No. 217).

HAWFINCH (*Coccothraustes vulgaris*, Pallas.).

220, 221. 2 Males; Mollington, Chester; 11th January, 1889.—Filled with kernels of the hawthorn.

222, 223. 1 Male; 1 Female; Manley, Cheshire; 11th January, 1889.—Kernels of the hawthorn mixed with fragments of the outer shell.

224. Male; Whitchurch, Salop; 15th February, 1895.—Filled with kernels of the hawthorn, mixed with fragments of the hard shell.

225. Male; Aldford, Chester; 22nd March, 1899.—Filled

with kernels of the hawthorn, mixed with fragments of the shell.

226. *Male*; *Christleton, Chester*; *6th April, 1895*.—Kernels of the hawthorn, mixed with fragments of the shell.

227. ? *Sex*; *Cheshire*; *12th July, 1895*.—Kernels of the wild cherry or plum, mixed with fragments of the shells.

228. *Immature*; *Hoole, Chester*; *21st July, 1893*.—Kernels of "stone fruit" (plum or cherry).

229. ? *Sex*; *Eaton, Chester*; *August, 1904*.—Kernels from the fruit of the yew and Portugal laurel.

230. ? *Sex*; *Eaton, Chester*; *12th September, 1904*.—Kernels from the fruit of the yew.

231. *Male*; *Cheshire*; *29th November, 1903*.—Kernels of the wild cherry or plum mixed with many fragments of the shells.

232, 233. 2 Examples; *Mollington, Chester*; *26th November, 1888*.—Filled with kernels of the hawthorn with small fragments of the shell.

234. ? *Sex*; *Cheshire*; *December, 1904*.—Seeds of the sycamore.

235. *Female*; *Mollington, Chester*; *15th December, 1888*.—Several whole kernels and many fragments of the yew, mixed with fragments of the outer shell.

236. *Female*; *Mollington, Chester*; *15th December, 1888*.—50 kernels and many fragments of the yew. No shells mixed with the food.

237-239. 3 *Females*; *Mollington, Chester*; *15th December, 1888*.—Kernels of the fruit of the yew mixed with small fragments of the shell.

240. *Male*; *near Chester*; *27th December, 1894*.—Kernels of hawthorn mixed with fragments of outer shell.

Summary.—10 contained kernels of the hawthorn; 1, Portugal laurel; 3, cherry and plum; 7, yew; 1, sycamore.

Field Notes.—241. *Garden Peas*.—This bird has a great fondness for garden peas and sometimes causes considerable injury to this crop. It comes generally in small family parties, and so persistent are they in their attacks that many of them get shot down. The greatest number of these birds seen congregated together was in a garden at Ingoldisthorpe, near Kings Lynn, Norfolk, in the summer of 1905. Here they were

attracted chiefly by the fruit of a small cherry-like tree (*?Prunus* sp.), the kernels of which they readily extracted, the ground beneath the trees being thickly strewn with the thin brittle shells or "stones." Several examples had been shot, on account of the injury they had caused to the peas, before I discovered their presence. In spite of the persistent persecution I was delighted to find that some 8 or 10 individuals were left, and it was a pleasing sight to watch them extracting the kernels from the fruit of the tree to which I have referred.

Fruit of the Yew.—At Eaton, Chester, on the estate of the Duke of Westminster, this bird is fairly common, and, in the early autumn, it subsists very largely on the fruit of the yew, extracting the "kernels," evidently by preference, while the fruit is still in the green stage; some of the larger trees in the main drives through the park are often completely stripped of the fruit, and the empty kernels may be found lodged among the branches or upon the ground beneath them.

CHAFFINCH (*Fringilla coelebs*; Linn.).

242-252. 11 Females; *Ince, Chester*; 6th January, 1894.—All filled with seeds of the Knot grass (*Polygonum* sp.) mixed with a few fragments of brick.

253, 254. 2 Females; *Aldford, Cheshire*; 22nd February, 1894.—Garbage from kitchen midden; pebbles; fragments of brick.

255. Male; *Aldford, Cheshire*; 17th March, 1894.—A quantity of vegetable fibres; quartz grains; cinders and bricks.

256-258. 1 Male, 2 Females; *near Chester*; 7th June, 1892.—Filled entirely with fragments of beetles, chiefly weevils (*Curculionidae*); pebbles.

259. Nestling Young (nearly fledged); *near Chester*; 21st June, 1908.—Almost filled with equal proportions of the remains of Noctuid moths and moth larvæ*; of the latter 1 at least was referable to the Winter Moth (*Cheimatobia brumata*). There were besides these: wing cases of 2 small weevils; 1 earwig; a quantity of fine grit and small pebbles.

* My brother, Mr. Alfred Newstead, who had spent some considerable time during the day (June 21st) in watching the parents, assured me that the major portion of the food brought in to the young consisted of green geometrid caterpillars, and that they were collected from the fruit trees in the orchard where the nest was built.

260-268. 9 *Males*; near Prestatyn, North Wales; 30th October, 1899.—Filled with seeds of the charlock.

Summary.—4 contained insects of the injurious group; 20, seeds; 2, garbage; 1, vegetable fibres.

Field Notes.—Large numbers were seen feeding on beech masts, in company with Bramblings, at Chalfont, Bucks, in the winter of 1908.

LINNET (*Linota cannabina* (Linn.).)

269. *Great Witcombe, Gloucester*; August, 1904.—Feeding freely on Selfheal (*Prunella vulgaris*) and the small composite *Hieracium pilosella*.

270. *Female*; Aldford, Chester; 6th July, 1894.—Seeds of dock (*Rumex*) and dandelion (*Taraxicum officinale*); pebbles of quartz; fragments of brick.

271. *An enormous flock of several hundred*; near Whitford, Holywell, North Wales; 11th October, 1904.—Feeding together on the seeds of the charlock which had practically overgrown a field of potatoes. I did not observe any other birds with them. The trees adjacent to the field in question were alive with them.

272. *Small flock on the hills above Prestatyn, North Wales, in company with Chaffinches, Green Finches and Yellow Buntings*; 30th October, 1904.—Feeding on the seeds of the charlock in a wheat stubble. The dead charlock plants were in proportion to the corn plants about 50 per cent. Almost all the seeds had been extracted, and the ground was strewn with open pods and other fragments of the seed vessels.

LESSER REDPOLL (*Linota rufescens*, Vieillot).

273. *Young*; Aldford, Chester; 15th June, 1894.—7 larvæ of a Tortricid moth; fragments of a weevil.

274. *Female*; Oakmere, Cheshire; 18th December, 1888.—Seeds of milfoil (*Achillea millefolium*) and other seeds (sp. incert.).

275. *Eaton, Chester*; 2nd December, 1904.—Many feeding on the catkins of the alder.

Summary.—1 contained insects of the injurious group; 1 seeds of noxious weed.

BULLFINCH (*Pyrrhula europaea*, Vieillot).

276-283. 5 Females, 3 Males; Capenhurst, Cheshire; 11th January, 1905.—All the 8 examples contained fragments (in stomach) and almost perfect fruits (in gullet) of the seed of the sycamore (*Acer pseudo-platanus*); the seed had, in nearly all cases, been divested of its epidermal layer. There were also many small fragments of cinders and bricks. (These birds were said to have been "shot while in the act of destroying fruit buds.")

284. Male; Ince, Chester; 22nd January, 1894.—Filled with the kernels of the hawthorn; small pebbles and fragments of brick.

285, 286. 1 Male, 1 Female; Aldford, Chester; 22nd February, 1894.—Filled with the kernels of the hawthorn mixed with many small pebbles.

287. Male; Prestatyn, North Wales; April, 1908.—Filled with buds (?) plum) divested of the scales mixed with several small round pebbles. This bird was "shot while in the act of destroying fruit buds."

288. Fledged Young; near Gloucester; August, 1901.—Filled with about equal proportions of the seeds of the elder (*Sambucus nigra*) and the blackberry (*Rubus* sp.).

289, 290. 2 Females; Crickleigh, Gloucester; August, 1904.—Filled with the fresh seeds of Selfheal (*Prunella vulgaris*) and the small composite (*Hieracium pilosella*).

291-295. 3 Males, 2 Females; Mollington, Chester; 22nd November, 1888.—All 5 examples contained seeds of dock (*Rumex*), blackberry (*Rubus*), and a few small pebbles.

296-298. 3 Males; near Chester; 31st November, 1903.—All 3 examples contained seeds of the dock and a few seeds of charlock.

299a-c. 2 Males, 1 Female; Oakmere, Cheshire; 18th December, 1888.—All three contained seeds of the dock, blackberry and nettle (*Urtica dioica*); small pebbles.

Summary.—11 contained seeds of sycamore; 3, hawthorn kernels; 1, seeds of elder; 9, seeds of blackberry; 2, seeds of selfheal; 11, seeds of dock; 3, seeds of charlock; 3, seeds of nettle; 2, hawkweed; 1, fruit buds.

Field Notes.—Destruction of Fruit Buds.—The serious nature

of the havoc which this bird commits in destroying the buds of various fruit trees is so generally known that it would be superfluous to add to the already extensive literature on this subject. It may be important to note, however, that while some gardens are subject to the annual depredations of this bird, others, even where it is common, are free from its attacks. Of the 23 post-mortem records given in the above table, 1 example only contained fruit buds (? plum). The 8 examples which were shot on fruit trees (Nos. 276-283) and were forwarded with the note that they had been destroying the buds, had, we find, regaled themselves with the seeds of the sycamore. Whether these examples had destroyed the buds or not, it is quite clear that they had not regaled themselves with any portion of them ; it is possible, therefore, that the birds were shot before they had time to eat the buds. Otherwise the destruction of the buds must be put down as a piece of wanton mischief.

299d. *Seeds of Selfheal*.—During the months of July, August and September this bird subsists very largely on the seeds of Selfheal (*Prunella vulgaris*). I do not know if this habit is at all general, but in certain parts of Gloucestershire I have watched it for hours together feeding exclusively upon the seeds of this noxious weed. The fruit is extracted quite easily, and by far the greater proportion is eaten unripe (see also Nos. 289, 290).

299e. *Seeds of Composites and Nettles*.—The seeds of certain composites are also eaten occasionally, especially those of the dandelion (*Taraxicum officinale*) and a species of hawkweed (*Hieracium pilosella*) which is found abundantly in the elevated pasture lands of the Cotswolds in Gloucestershire. This habit I have noted in the fen lands of Cambridgeshire, Gloucestershire, Norfolk and Cheshire. The seeds of the nettle (*Urtica dioica*) are also eaten in large quantities, and extensive beds of this plant in waste places and hedgerows are favourite resorts for this bird during the autumn and winter months.

CROSSBILL (*Loxia curvirostra*, Linn.).

300. *Male; Whitchurch, Salop; 14th February, 1895.*—Seeds of the Scots pine ; many pure white quartz pebbles.

301-303.—1 *Male*; 2 *Immature*; *Oakmere, Cheshire*; *December, 1889*.—All three contained seeds of the Scots pine and a quantity of kernels of the hawthorn; 1 only had pebbles with the food.

Summary.—4 contained seeds of the Scots pine; 3, kernels of hawthorn.

YELLOW BUNTING OR YELLOWHAMMER (*Emberiza citrinella*, Linn.).

304. *Female*; *Cheshire*; *15th January, 1894*.—Several grains of wheat and a quantity of fine sand.

305. *Male*; *Aldford, Cheshire*; *4th April, 1895*.—Entirely of weevils (Rhynchophora); a few quartz pebbles and brick. The insects were broken into very small fragments, so that they could not be identified specifically.

306. *Male*; *Aldford, Chester*; *24th April, 1894*.—Glumes of wheat (? from horse droppings), and fragments of 2 weevils.

307. *Immature*; *Ince, Chester*; *16th August, 1895*.—Many grains of wheat; small pebbles.

Summary.—2 contained insects of the injurious group; 3, wheat.

Field Notes.—307A.—Once when collecting insects in the immediate neighbourhood of Mold, Denbighshire, I saw a pair of Yellow Buntings feeding their young (a second brood) on Crane Flies (*Tipula* sp.).

REED BUNTING (*Emberiza schoeniclus*, (Linn.).

308. *Male*; *near Chester*; *15th February, 1895*.—A few grains of wheat and a small quantity of black sand.

309. ? *Sex*; *Aldford, Chester*; *8th March, 1894*.—Almost filled with seeds of *Carex* sp.; numerous fine pebbles.

310, 311. 2 *Males*; *Aldford, Chester*; *30th March, 1894*.—Many small reddish moth larvæ (Noctuids); fragments of the Water Boatman (*Notonecta glauca*) and small weevils.

312. *Female*; *Eaton, Chester*; *7th May, 1894*.—Many fragments of beetles (Rhynchophora, &c.); 3 moth larvæ (Geometers); sand.

Summary.—3 contained insects of the injurious group; 2, indifferent group; 1, wheat; 1, seeds.

CORN BUNTING (*Emberiza miliaria*, Linn.).

313. ? Sex; Ince, Chester; 24th December, 1889.—Germinated wheat; pebbles.

JAY (*Garrulus glandarius* (Linn.).

314. ? Sex; Eaton, Chester; 4th February, 1890.—Filled with acorns divested of the shells.

315. ? Sex; Cheshire; 4th February, 1890.—Filled with acorns divested of the shells.

316. Male; Whitchurch, Salop; 15th February, 1895.—Filled with acorns divested of the shells; bones of a small mammal (? mouse or vole).

317. ? Sex; Cheshire; April, 1906.—Filled with equal proportions of wheat (no husks) and oat glumes; mixed with the remains of a large Geodephagous beetle.

318. ? Sex; Cheshire; April, 1906.—Filled with grass, mixed with the remains of 1 dung beetle (*Geotrupes stercorarius*).

319. ? Sex; Cheshire; April 25th, 1908.—Completely filled with the remains of click beetles or "skipjacks" (*Agriotes obscurus*) the thoraces of 127 specimens being intact; 1 Geodephagous beetle (*Pterostichus versicolor*).

320. ? Sex; Cheshire; 25th April, 1906.—Filled with equal proportions of acorns (without shells) and oat glumes, mixed with many pebbles.

321. Male; Eaton, Chester; 23rd May, 1895.—Partly filled with pieces of potato; many skins of moth larvæ (Noctuids and Geometrids); 3 fragments of egg shell of ? mallard; fragments of brick.

322. Female; Eaton, Chester; 23rd May, 1895 (shot while sitting on her eggs).—Over 120 larvæ of the winter moth (*Cheimatobia brumata*); 2 cockchafers (*Melolontha vulgaris*), the head and thorax of which had been rejected; many fragments of egg shell of Pheasant, bearing traces of blood vessels (? taken in lieu of pebbles); fragments of brick; fragments of leaves.

323. Female; Delamere, Cheshire; 28th May, 1901.—Remains of 4 cockchafers (*Melolontha vulgaris*); 1 dung beetle (*Geotrupes stercorarius*); many pebbles.

324. Male; Delamere, Cheshire; 28th May, 1901.—Stomach almost filled with the larvæ of the large Emerald Moth (*Geo-*

metra papilionaria) ; minute fragments of beetles ; skins of moth larvæ ; 50 odd pebbles.

325. *Female* ; *Eaton, Cheshire* ; *7th June, 1892*.—Remains of many moth larvæ ; several Geodephagous and Rhyncophorous beetles (*Amara* spp., *Pterostichus* sp., *Sitones* sp.) ; a few pebbles.

326. *Male* ; *Delamere, Cheshire* ; *7th June, 1892*.—Many moth larvæ ; remains of Geodephagous and Rhyncophorus beetles ; pebbles.

327. *Nestling (fledged)* ; *Abbots Moss, Cheshire* ; *12th July, 1902*.—Remains of many click beetles (*Athous haemorrhoidalis* and *Agriotes* sp.) ; fragments of weevils ; a few small pieces of potato ; incisor tooth of small rodent ; pebbles weighing 1.55 grammes).

328. *Nestling (fledged)* ; *Abbots Moss, Cheshire* ; *12th July, 1902*.—Remains of 1 Dragon Fly (*Aeschna juncea*), the wings of which were almost intact ; 5 large Noctuid moths (*Xylophasia* ?) ; several Geometer moths.

329. ? *Sex* ; *Cheshire* ; *24th September, 1901*.—Acorns divested of the outer shell ; several earwigs ; fragments of brick and pebbles.

330. ? *Sex* ; *Cheshire* ; *November, 1903*.—Filled with acorns ; a few pebbles.

331. ? *Sex* ; *Aldford, Cheshire* ; *5th November, 1894*.—Filled with acorns divested of the shells.

332. ? *Sex* ; *Cheshire* ; *December, 1903*.—Filled with acorns divested of the shells ; pebbles.

333. ? *Sex* ; *Cheshire* ; *December, 1903*.—Filled with acorns divested of the shells.

334. *Male* ; *Delamere, Cheshire* ; *15th December*.—Glumes of oats (?) from horse dung) ; pebbles.

335. *Male* ; *Delamere, Cheshire* ; *15th December, 1888*.—Glumes of oats (?) from horse dung) ; a few grains of wheat ; pebbles.

336. *Female* ; *Delamere, Cheshire* ; *15th December, 1888*.—Many grains of wheat and a few pebbles.

Summary.—10 contained insects of the injurious group ; 4, beneficial group ; 4, indifferent group ; 5, wheat and oats ; 9, acorns ; 2, potato ; 2, shells of birds' eggs ; 1, miscellaneous ; 1, grass ; 2, bones of mammal.

MAGPIE (*Pica rustica* (Scopoli)).

337. ? Sex; near York; 11th March, 1904.—Chiefly vegetable matter (grass and glumes of oats); remains of 8 to 9 weevils (*Otiorhynchus* sp., *Barypeithes brunnipes*, &c.).

338. ? Sex; Yorkshire; 11th March, 1904.—Numerous fragments of beetles (Geodephaga and Rhynchophora); 1 holly berry; many small pellets of sheep's wool.

339. ? Sex; near Chester; 4th April, 1905.—Contained about equal proportions of acorns and beetles. The latter consisted of 1 *Carabus nemoralis*, many dung beetles (Aphodii), and fragments of weevils.

340. Female; Eaton, Chester; 7th May, 1894.—3 mature larvae of a large Noctuid moth; 1 *Sitones* sp.; fragments of *Geotrupes* sp.; 2 click beetles (*Agriotes obscurus*, *Athous* sp.); 2 wireworms; fragments of Geodephagous beetles.

341. Female; Eaton, Chester; 7th May, 1894.—1 moth larvae (Noctuid); 1 weevil (*Sitones* ? *sulcifrons*); 3 click beetles (*Agriotes* ? *lineatus*); 1 wireworm.

342. Female; Delamere, Cheshire; 15th May, 1889.—The following dung beetles:—10 *Aphodius fimetarius*; many *A. punctato-sulcatus*; 3 sp. of *Sphaeridium*; also the Geodephagous beetles: 1 *Amara* sp.; 2 *Anchomenus marginatus* and fragments of weevils.

343. Nestling; Mouldsworth, Cheshire; 4th June, 1903.—Filled with the remains of 5 or 6 cockchafers (*Melolontha vulgaris*), some of the specimens being almost perfect.

344. ? Sex; Dee Marshes; October, 1904.—Remains of field vole (*Microtus agrestis*, Linn.); fragments of Coleoptera; 7 small angular pieces of brick; a small pellet of sheep's wool.

Summary.—7 contained insects of the injurious group; 4, beneficial group; 4, indifferent group; 1, wheat and oats; 1, acorns; 1, a holly berry; 1, a field vole; 2, pellets of sheep's wool.

Field Notes.—At Nant-y-Glyn, Colwyn Bay, 1885, I saw this species rob the nest of a Song Thrush of its young, but I cannot say if this habit is at all general. The young Thrushes were only a few days old, and were carried off in the direction of the Magpie's nest and were probably fed to the young ones.

JACKDAW (*Corvus monedula*, Linn.).

345. *Male*; *Eaton, Chester*; *15th April, 1895*.—Several examples of the weevils *Otiorhynchus sulcatus* and *Sitones sulcifrons*; glumes of oats; wheat; a small ball of sheep's wool.

346. *Female*; *Eaton, Chester*; *15th April, 1895*.—Glumes of the oat, ? from horse dung.

347. *Male*; *Eaton, Chester*; *15th April, 1895*.—2 scale insects (*Lecanium genevense*) ; 1 beetle (*Chrysomela staphylæa*) ; several weevils (*Otiorhynchus sulcatus* and fragments of other species) ; glumes of the oat ; pebbles and a No. 7 gunshot taken in lieu of a pebble.

348. *Female*; *Eaton, Chester*; *15th April, 1895*.—Glumes of the oat (? from horse dung) ; fragments of small weevils ; a ball of sheep's wool ; 2 angular pieces of rock and 1 of mortar.

349, 350. 2 *Females*; *Aldford, Chester*; *24th April, 1894*.—Both examples filled with wheat mixed with a very few fragments of Coleoptera. The wheat had in all probability been used as a bait.

351. *Nestling (feathered)*; *Delamere, Cheshire*; *20th May, 1901*.—10 almost perfect click beetles (*Athous haemorrhoidalis*) ; 2 Geodephagous beetles (*Carabus violaceus*, *C. catenulatus*) ; many fragments of other Coleoptera ; 1 large Dipteron (*Bibio* sp.) ; numerous angular pebbles.

352. *Female*; *Delamere, Cheshire*; *28th May, 1901*.—Fragments of many weevils ; click beetles (*Athous* sp.) ; 1 shell of *Vitrina pellucida* ; 1 young potato about the size of a pea and fragments of others.

353. *Nestling (feathered)*; *Delamere, Cheshire*; *28th May, 1901*.—1 full-fed larva of the butterfly *Epinephele tithonus* ; 1 full-fed larva of Antler moth (*Charæas graminis*) ; several larvæ of the Winter moth (*Cheimatobia brumata*) ; 1 of *Hybernia defoliaria* and other Geometers ; 1 almost perfect example of the dung beetle, *Geotrupes stercorarius*.

354. *Male*; *Mouldsworth, Cheshire*; *4th June, 1903*.—A few Noctuid moth larvæ ; remains of the cockchafer, *Melolontha vulgaris*.

355. ? *Sex*; *Eaton, Chester*; *16th June, 1901*.—Filled with wheat and other cereals which had probably been used as a bait to attract the bird.

Summary.—7 contained insects of the injurious group; 1, beneficial group; 4, indifferent group; 7, wheat and oat glumes; 1, potato; 1, mollusc; 2, sheep's wool.

Rook (*Corvus frugilegus*, Linn.).

- 356, 357. 2 Females; *Eaton, Chester*; 7th May, 1894.—Several earthworms; 1 moth larva (Noctuid); 1 weevil (*Ceuthorrhynchus* sp.); 1 cocoon of ichneumon; fragments of brick and mortar.
358. Fledged Young; *Manley, Cheshire*; 19th May, 1905.—47 moth larvæ (Noctuæ).
359. Fledged Young; *Manley, Cheshire*; 19th May, 1905.—75 moth larvæ (Noctuæ).
360. Fledged Young; *Manley, Cheshire*; 19th May, 1905.—23 moth larvæ (Noctuæ); 1 grain of wheat; 1 mollusc.
361. Fledged Young; *Manley, Cheshire*; 19th May, 1905.—Filled with wheat glumes mixed with fragments of beetles (*Geotrupes* sp.); many pebbles.
362. Fledged Young; *Manley, Cheshire*; 19th May, 1905.—Remains of dung beetle (*Geotrupes* sp.); vegetable fibres; a few wheat glumes; several large pebbles.
363. Fledged Young; *Manley, Cheshire*; 19th May, 1905.—65 moth larvæ (Noctuæ); 1 grain of wheat; 1 wireworm (*Agriotes* sp.); remains of dung beetle (*Geotrupes* sp.).
364. Fledged Young; *Manley, Cheshire*; 19th May, 1905.—Several pieces of potato tuber; remains of the beetle *Geotrupes* sp.
365. Fledged Young; *Manley, Cheshire*; 19th May, 1905.—32 grains of wheat; several pieces of potato tuber.
366. Fledged Young; *Manley, Cheshire*; 19th May, 1905.—3 moth larvæ (Noctuæ); pieces of potato tuber; remains of click beetle (*Agriotes* sp.).
367. Fledged Young; *Manley, Cheshire*; 29th May, 1905.—Many moth larvæ (Noctuæ); remains of the dung beetles (*Geotrupes* spp.); remains of click beetle (*Agriotes* sp.); many pebbles.
368. Male; *near Gloucester*; July, 1905.—Filled with wheat and fragments of maize.
369. Male; *Crickleigh, Gloucester*; August, 1901.—Filled

with fragments of pear, mixed with the remains of 1 dung beetle (*Geotrupes stercorarius*).

Summary.—8 contained insects of the injurious group; 1, beneficial group; 6, indifferent group; 1, mollusc; 2, earthworm; 3, potato; 6, wheat and oats; 1, maize; 1, fragments of pear; 1, vegetable fibre.

Field Notes.—370. *Oak Tortrix Moth*.—Every summer, when the caterpillars of the Green Oak Tortrix Moth (*Tortrix viridana*) are devastating the oaks in the Forest of Delamere, flocks of Rooks and Jackdaws congregate in the infested trees and may be seen busily engaged in searching for insects; I have come to the conclusion, therefore, though it is possible that I may be wrong, that these birds feed extensively upon the larvæ and pupæ of this destructive insect. Other moth larvæ are undoubtedly present upon the trees at the same time but it is reasonable to assume that the birds are attracted by those insects which occur in the greatest numbers.

371. *Potato Tubers*.—Potato tubers are sometimes grubbed up by these birds and carried away. This habit has been observed at Bull Bay, Anglesey, and in one locality in Cheshire; but this trait cannot, I think, be considered at all general, and the harm done in this direction is scarcely worth consideration.

372. *Walnuts*.—In Cambridgeshire I have seen them carry off unripe walnuts, of which they seemed particularly fond; but this trait was confined to a few daring individuals and the amount of damage was not of a serious nature.

373. “*Leather Jackets*.”—In the *Gardeners’ Chronicle* for January 21st, 1905, No. 943, pp. 34, 35, I dealt with “some new facts concerning the economy of the Crane Fly (*Tipula oleracea*) and its natural enemies.” In this paper I endeavoured to show to what extent Rooks feed upon the destructive larvæ of this insect; and as the facts are of agricultural importance it has been thought desirable to reproduce them in order that my observations may be as complete as possible; all the more so seeing that the post-mortem records of this bird are so meagre.

“ Since the days when John Curtis published his *Farm Insects* in 1860, much has been written on the depredations of the Tipulæ or crane flies, but comparatively little that is new has since been added to the interesting account which

'Ruricola' has given us of these destructive pests. Four years ago (1902) there was an alarming plague of the larvæ on the golf links in the marshes of the Dee, Cheshire. It was on this occasion that the writer had exceptional opportunities of observing the habits of these insects, and some facts then gleaned may at least prove of interest if not instructive. It should be clearly understood, however, that there are at least three species of crane flies which are destructive to crops and plants of various kinds, and also that the larvæ of all of them are popularly known as 'leather jackets.' The following facts, however, concern one species only, *Tipula oleracea*, one of the largest and most familiar of the family :—

"The infested area under observation extended over several hundred acres, covering practically the whole of the grass land of the marshes, a great portion of which is perpetually grazed by sheep, the remainder being reserved for the use of the golf club. It was on the ground of the latter that the observations were chiefly made. The unmown grass on the links is generally short, and amongst it grows patches of White Clover, with here and there tufts of the Sea Pink (*Armeria maritima*) and other less common plants. Almost every square yard of grass was injured more especially so in the shallow depressions and deeper hollows. In these the grass was so completely destroyed that there was not a green blade left, and the dead brown patches extended in every direction over the whole of the land. So effectually had the 'leather jackets' severed the crowns of the plants that one could, with little difficulty, roll back the turf into large masses, leaving the ground smooth and bare, exposing the surface-tracks of the larvæ. Strange to say, the White Clover and the Thrift were left intact and uninjured, and large patches and isolated plants of the former were growing amidst and through the dead grass which had been severed from its roots. On exposing the bare ground one also succeeded in occasionally disinterring a 'leather jacket,' but such instances were rare. By carefully skimming off a thin layer of soil one immediately exposed to view innumerable burrows large enough to admit an ordinary-sized slate pencil. In these the larvæ were discovered, and by making a vertical section of the burrows one also found that each larva had excavated for itself a separate J-shaped dwelling into which

it had retreated for the day, and where, for greater safety, it had gone as far as it could into the upturned portion, carefully blocking the entrance with débris and soil so as to conceal it. From this subterranean retreat the larvæ were with difficulty extracted except by digging them out; and many suffered themselves, as do worms, to be extracted piece-meal with a pair of small forceps rather than relinquish their hold. Indeed the resistance they offered when occupying the upturned portion of the burrow was extraordinary. As to their numbers, there was an average of 10 larvæ to the square foot, or 90 to the square yard; in the badly infested spots there would be quite double that number. The larvæ which were kept under observation were found to leave their burrows at night, returning again to them during the day. Pupation took place throughout the month of August, the first two flies appearing in the breeding-cage on the 11th of the same month, and others continued to hatch until the end of September. In the infested area the crane flies were more abundant in the early part of September, when they occurred in myriads; and on one occasion, during a north-west wind, millions of them were swept together into the sheltered corners of the golf pavilion.

" During the month of June, when the 'leather jackets' or larvæ were devastating the grass, the Rooks flocked to the infested area and devoured the grubs in great numbers. Their feeding time was during the early hours of the morning and again during the evening, after the golfers had gone away. Small parties were also to be seen at intervals throughout the day. The method adopted by the Rooks for extracting the larvæ was simple and, at the same time, extremely interesting. As already stated, each larva retreated during the daytime into the upturned portion of its burrow, where it was perfectly concealed and apparently safe, there being but one exit and that invariably blocked at the entrance, then over all was the additional mat-like surface of grass. Apart from the dead grass there was, therefore, no external evidence of the existence of the larvæ. The Rook had first of all to find out the larval retreat, and this it apparently does by probing with its beak and pulling away tufts of grass. Having located a burrow the bird then ascertains the direction in which it is curved,

finally excavating the overlying soil exactly in the right place, thereby exposing the curved end of the burrow and its helpless tenant. It would be impossible to give anything like an approximate estimate of the number of grubs that were thus taken by the Rooks; but it is quite safe to compute the number at 25 per cent., a very high percentage considering the extent of the infested area; but the Rooks were attracted to this rich feeding ground in enormous numbers, and by their unremitting search for the grubs did more to reduce the devastating army than could any human agency. It was during the months of June and July that the Rooks made their attack, and when the larvæ had pupated and the flies began to appear these birds left the district for other fields."

RAVEN (*Corvus corax*, Linn.).

374. Female; *Arenig*, near *Bala*; 23rd April, 1903.—1 egg of the grouse, in broken fragments; a quantity of carrion mixed with sheep's wool; 1 small bone of a mammal; bits of moss and other vegetable matter; 1 pebble.

CARRION CROW (*Corvus corone*, Linn.).

375. Female (incubating); *Crickleigh*, *Gloucester*; 23rd April, 1906.—Filled with dung of ? horse or ox containing numerous fragments of the beetles *Aphodius fimetarius*, *A. fessor*, and 1 *Pterostichus madidus*; 1 grain of maize.

Summary.—Contained insects of the indifferent and beneficial groups and corn.

SKYLARK (*Alauda arvensis*, Linn.)

376. Male; *Dee Estuary*; 15th January, 1894.—A large quantity of grass; a few pebbles.

377. ? Sex; *Dee Estuary*; 15th January, 1894.—A mass of vegetable fibre (chiefly grass), mixed with turnip leaves; 2 beetles (*Helophorus aquaticus*); large pebbles.

378. Female; *near Chester*; 24th February, 1894.—Grass; remains of 1 beetle (Staphylinid); fragments of brick and quartz pebbles.

379. ? Sex; *Aldford, Chester*; 22nd March, 1894.—Numerous fragments of weevils (Otiorhynchidae, Curculionidae); 1 spider; imperfect seeds of *Polygonum* sp.; fragments of brick; pebbles.

380. ? Sex ; Guernsey ; 24th March, 1904.—Chiefly of fresh grass seeds (*Poa annua*) ; a few seeds of *Lychnis* sp. ; pebbles.

381. ? Sex ; Aldford, Chester ; 23rd June, 1894.—Chiefly weevils (*Hypera nigrirostris*, &c.) ; many Halticid beetles (*Phyllotreta undulata*, &c.) ; numerous grass seeds (*Poa* sp.) ; pebbles.

Summary.—2 contained insects of the injurious group ; 1, beneficial group ; 1, indifferent group ; 1, spider ; 3, grass and its seeds ; 2, seeds ; 1, turnip leaves.

STARLING (*Sturnus vulgaris*, Linn.).

382. Male ; near Chester ; March, 1895.—Chiefly beetles (Rhynchophora and Geodephaga).

383. Male ; Aldford, Chester ; 3rd April, 1894.—78 almost perfect wing cases of the dung beetle *Aphodius fimetarius* ; portions of *Amara* sp. ; 1 shell of *Cochlicopa lubrica*. This example was shot while hawking flies in the air.

384. Male ; Aldford, Chester ; 24th April, 1894.—Chiefly weevils (*Barynotus obscurus*, *Alophus trigattatus* (many), and remains of other species) ; 1 wireworm beetle (*Agriotes lineata*) ; a few blades of grass.

385. ? Sex ; near Chester ; 6th June, 1889.—Filled with dung-feeding beetles (*Aphodius* spp., *Sphaeridium* spp.).

386. ? Sex ; near Chester ; August, 1903.—3 large weevils (1 *Liophlæus nubilus*, 2 *Barynotus obscurus*) ; 1 larva of Cabbage Moth (*Mamestra brassicæ*). These insects were practically intact.

387. Male ; Cheshire ; August, 1903.—Chiefly weevils (*Barynotus obscurus*, &c.) ; skins of moth larvæ.

388, 389. 1 Immature ; 1 Female ; near Chester ; August, 1893.—(a) Many weevils (Otiorhynchidae and Curculionidae) ; a little grass ; pebbles. (b) Many weevils (as in (a)) ; portions of the beetle *Pterostichus versicolor* ; a few grains of wheat ; pebbles.

390. Female ; near Chester ; 15th August, 1893.—A quantity of grass ; fragments of dung-feeding beetles (*Aphodii*) ; 1 Geodephagous beetle (*Harpalus proteus*).

391. Immature ; Cheshire ; 2nd September, 1903.—Chiefly dung-feeding beetles (*Aphodius fimetarius* and *A. contaminatus*) ; 1 *Amara* sp. ; a few beetle larvæ (Scarabeidae) ; remains of the Crane Fly or Daddy Long Legs (*Tipula* sp.) ; 1 blade of grass.

392. *Male*; *Northwich, Cheshire*; *8th September, 1903.*—Chiefly dung-feeding beetles (*Aphodius fimetarius*, *A. contaminatus*, &c.); two grains of undressed wheat; a few short blades of grass.

393. *Immature*; *Hartford, Cheshire*; *12th September, 1903.*—Chiefly remains of Daddy Long Legs (*Tipula* sp.); several dung-feeding beetles (*Aphodius* spp.).

394. *Male*; *Skerries, Anglesey*; *30th October, 1900.*—Many oat glumes (? from horse droppings); remains of the dung beetle *Aphodius fossor*.

395, 396. *2 Males*; *Christleton, Chester*; *25th November, 1904.*—Both examples filled with equal proportions of vegetable matter and insects; the former consisted of wheat and oat glumes and one complete grain of the oat, the insects chiefly small Dipterous maggots (*Homalomyia* sp.); 1 *Notiophilus biguttatus* and remains of other Geodephagous beetles; several weevils (*Sitones* sp.). There were also a few molluscs (*Zonites* sp.).

397. *? Sex*; *near Chester*; *30th November, 1904.*—1 surface caterpillar (? *Tryphaena*); 104 small larvae of Dipterous flies (4 *Stratiomyidae*, 100 *Muscidae*); 2 grains of wheat; 1 land shell (*Pisidium* sp.).

Summary.—11 contained insects of the injurious group; 5, beneficial group; 7, indifferent group; 5, wheat; 2 oats; 4, molluscs; 5, grass.

Field Notes.—397A. Food of 3 Nestling Young; Chester; 22nd–27th May, 1908.*—Chiefly earthworms and larvae of the Crane Fly (*Tipula oleracea*), with an occasional caterpillar. These observations were made for very short periods in the mornings and evenings, when 25 visits were made to the young.

398. *30th May.*—During 55 consecutive minutes 20 visits were made to the young. The food was recognised in 13 instances, and consisted of the following:—

18 full-fed caterpillars of large Noctuid moths of three distinct species, *Triphaena pronuba* being the only species recognised; 4 wireworms (*Agrotis* sp.); 1 larva of crane fly; 1 lot of moist bread.

* The notes Nos. 397A–405, inclusive, were made on a single brood of young starlings in the suburbs of Chester within a short distance of cultivated fields and pastures.

399. 6th June.—The food brought in on three occasions consisted of the following :—

15 to 17 full-fed larvæ of the Geometrid or Mottled Umber Moth (*Hybernia defoliaria*) ; and 2 large larvæ of a Noctuid moth (? *Triphaena*).

400.—Between 3.50 P.M. and 7.55 P.M. 25 visits were made by the parent birds and the following were identified :—

11 large Noctuid larvæ (*Triphaena*, &c.) ; 2 Tipulid larvæ (probably *Tipula oleracea*) ; 8 to 10 Crane Flies (*Tipula* sp., probably *T. oleracea*) ; bread, 3 lots ; 2 molluscs, probably *Zonites cellarius* ; several small insects and 1 grasshopper were brought in on one occasion, but the former were much too small to be recognised.

401. 7th June.—Between 5.15 A.M. and 12.15 P.M., with 30 minutes interval between 8.25 A.M. and 9 A.M., 79 visits were made during the 6½ hours. The following is a summary of the food which was identified :—

25 larvæ of a large species of Noctuid moths, possibly *Triphaena orbona* ; 60 to 70 larvæ of the Geometrid or Mottled Umber Moth (*Hybernia defoliaria*) ; 4 green Geometrid moth larvæ ; 2 chrysalids (pupæ) of the Yellow Underwing Moth (*Triphaena pronuba*) ; 4 Tipulid larvæ ; 2 beetles, 1 a weevil, the other a small carabid ; 1 beetle larva (Geodephagous) ; 4 wireworms (larvæ of *Agriotes* or allied genera) ; 3 molluscs (*Zonites ? cellarius*) ; 2 small earthworms. Small insects unidentified on 9 occasions (some were beetles and very probably all were, but they were so closely packed together that it was quite impossible to recognise more than one or two) ; bread, 5 lots. In addition to the foregoing 8 different lots of food were brought in which looked very like garbage from a kitchen midden, and 4 visits were made without bringing in food.

402. 8th June.—During the period between 5.15 A.M. and 11.30 A.M., the watching being suspended on several occasions during that time, the food brought in on 45 occasions was as follows :—

6 larvæ of large Noctuid moths (? *Triphaena* spp.) ; 60 to 70 larvæ of the Mottled Umber Moth (*Hybernia defoliaria*) ; 6 green larvæ of a Geometrid moth ; small beetles and

other small insects unidentified, 9 consignments, the beaks of the birds being generally well filled; 1 myriapod (*Gnophilus* sp., possibly *G. longicornis*); 2 small earthworms and 1 large "lobworm" entire; 7 small molluscs and 1 large one (*Zonites cellarius*); 14 lots of bread; 2 large pieces of cooked bacon.

403. *Food of Nestling Young accidentally dropped from the Nest by Parent Birds.*—As a rule the parent birds were most careful not to drop the food outside the nest, but on a few occasions a portion of the meal fell accidentally from their beaks,* and on two occasions the birds attempted to regain it. Both the chrysalids or pupæ of the Yellow Underwing Moth (*Triphaena pronuba*) (No. 401) fell to the ground as they were being passed to the young. It is just possible that they were rejected by the nestlings, but of this I could not be quite certain. They were brought in separately. The other objects which were obtained in this way were:—

3 shells of the mollusc *Zonites cellarius*; 1 St. Mark's Fly (*Bibio marci*); 2 crane fly larvæ (*Tipula* spp.), 1 being a fully-developed example of the destructive *T. oleracea*; 1 larva of the Mottled Umber Moth (*Hybernia defoliaria*); 1 dung beetle (*Sphaeridium scarabæoides*); 2 earwigs (*Forficula auricularia*).

These records are of great value as confirming the observations given in the previous records.

404. *Fæces of Nestling Young; same locality as previous records; 7th June.*—Occasionally the encapsulated fæces of the young were dropped immediately below the nest or on the lawn a few yards away. The examination of these did not yield very satisfactory results, but the following animals were identified:—

1 brown slug (*Limax agrestis*)†; 1 head of a Geodæphagous beetle; 2 wing cases of a large weevil; 1 wing case of the red dung beetle (*Aphodius* ? *fimetarius*); many heads of moth larvæ; a large quantity of fragments of plant remains.

* It is highly probable that the loss of these was occasioned by my presence in such close proximity to the nest, though I was careful to screen myself as much as possible.

† This animal was quite perfect, and still retained its colour pattern; no portion of it had been digested!

405. *Selection of Insects, &c., placed near the Nest by the Observer.*—The following collection of insects, &c., was placed near the nest of young Starlings upon which the previous records were made, with the view of ascertaining whether or not the parent birds would carry them to their young :—

- 3 examples of young garden snails (*Helix aspersa*), refused ;
- 2 examples of the small hairy snail (*Helix hispida*), refused ; 1 centipede (*Geophilus longicornis*), refused ;
- 2 earwigs (*Forficula auricularia*), 1 taken to the young, the other rejected ; 2 ground beetles (*Pterostichus madidus*), both taken to the young ; 2 Harvest Spiders (Phalangids), both fed to the young ; 6 wood lice (*Oniscus ascellus*), 1 carried to the young, the others although frequently picked up were all rejected ; 5 to 7 green cherries, refused.

During a total period of 17 hours, representing approximately the hours of 1 day during which food was collected for the young, 169* journeys were made to the nest. It may be interesting to note that 3 birds (2 males and 1 female) were seen on 4 occasions to bring food to the young. Of this I am absolutely certain as all 3 birds arrived at the nest almost simultaneously. As a rule, however, the birds paid alternate visits and there was an irregular interval between them.

An approximate summary of the food brought in during the 17 hours may be tabulated as follows :—

- 269 insects of the injurious group ; 4 of the beneficial group ;
- 2 of the indifferent group ; 30 earthworms ; 14 slugs and snails (molluscs) ; 1 centipede ; 1 wood louse ;
- 2 harvest spiders (Phalangids) ; 23 lots of bread ; 19 lots of garbage(?) from kitchen midden ; 10 lots of unidentified insects.

406. ? *Damaging Young Wheat Crop.*—The examples Nos. 395, 396 were forwarded with the note that “they were shot while in the act of damaging a young wheat crop,” but no trace of the young plants was found among the stomach contents, so that it is highly probable that the birds had pulled up the plants in order to secure the maggots or fly larvæ

* These figures must be taken as approximate. It was quite evident that on certain days the visits were much more frequent, giving an average for the 17 hours of about 340 ; so that my figures may, I think, be taken as a low average.

which they were found to contain. Whether these larvae were feeding on the young wheat plants I was not able to ascertain ; it is highly probable, however, that they were subsisting upon the manure or some other form of decaying vegetable matter in the soil surrounding the roots of the plants.

Destroying Cherries.—When cherries ripen the Starling displays a certain partiality for this fruit. Two instances have come under my own personal observation in Cheshire ; but the habit, so far as my experience goes, is not general in this county. In Gloucestershire, however, the habit is more general ; but so far as I am aware this is the only direction in which they levy toll for their great service to agriculture.

SWIFT (*Cypselus apus* (Linn.).

407, 408. 2 ? Sex ; Chester ; 27th May, 1891 ; found dead.—(a) Portions of 3 or 4 Staphylinid beetles (*Philonthus* sp., *Quedius* sp.) ; remains of 3 small Dipterous flies. (b) Completely empty.

409. ? Sex ; near Chester ; 26th June, 1894.—Several dung beetles (*Aphodius merdarius*) ; 3 small Dipterous flies.

410. Male ; Chester ; 30th June, 1893.—Chiefly Dipterous flies (Muscidae, &c.) ; 4 brachelytrous beetles (*Philonthus politus*, *Quedius* ? *tristis*, *Xantholinus glabratus*).

411-414. 4 Nestlings (feathered) ; Chester ; 30th June, 1893.—Three forms of the Coccinellid beetle (*Coccinella* 10-punctata (= *variabilis*)) ; several Dipterous flies (Muscidae, &c.) ; 1 Yellow Underwing Moth (*Triphaena pronuba*), found living in the nest but much mutilated.

415. Female (Parent of the young recorded above) ; Chester ; 30th June, 1893.—2 Coccinellid beetles (*Hippodamia mutabilis*) ; a large number of small frog-hoppers (Cicadæ) ; 2 small brachelytrous beetles ; several small beetles of the genus *Cryptophagus*.

Summary.—3 contained insects of the injurious group ; 7, beneficial group ; 3, indifferent group.

Field Notes.—416. *Plumed Gnats*.—Towards the end of May, 1894, between 40 to 50 of these birds were busily engaged in capturing Plumed Gnats (*Chironomus* sp.) which were dancing in myriads over a thorn fence near the River Dee, Chester. There can be no possible doubt that the birds had

been attracted by this unusual swarm of insects and that they were feeding upon them. I have noted the same habit recently, both at Chester and Oswestry.

NIGHTJAR (*Caprimulgus europaeus*, Linn.).

417. Female; *Delamere, Cheshire*; 15th May, 1889.—Remains of several dung beetles (*Geotrupes stercorarius*).

418. Male; *Oakmere, Cheshire*; 15th June, 1894.—5 almost perfect examples of *Geotrupes stercorarius* and fragments of others; remains of a Noctuid moth.

419. Male; *Oakmere, Cheshire*; 17th July, 1893.—Stomach filled with Noctuid and Geometrid moths, chiefly the former.

420. Young; *Cheshire*; August, 1903.—Minute fragments of beetles (Coleoptera); portions of a large Noctuid moth.

421. Young; *Helsby, Cheshire*; 27th August, 1903.—Fragments of Elaterid beetles; 1 dung beetle (*Geotrupes* sp.).

Summary.—4 contained insects of the injurious group; 4, indifferent group.

GREAT SPOTTED WOODPECKER (*Dendrocopos major* (Linn.).

422. Female; *Delamere, Cheshire*; 28th January, 1891.—Stomach almost filled with partly-digested larvæ and 3 imagines of the wood-boring beetle, *Rhagium bifasciatum*; 4 ladybird beetles (*Hippodamia mutabilis*); fragments of other beetles.

423. ? Sex; *Delamere, Cheshire*; 3rd February, 1889.—Filled with larvæ of the wood-boring beetle, *Rhagium bifasciatum*, mixed with fragments of other Coleoptera.

Summary.—2 contained insects of the injurious group; 1, beneficial group; 2, indifferent group.

LESSER SPOTTED WOODPECKER (*Dendrocopos minor* (Linn.).

424. Male; *Ince, Chester*; 26th March, 1894.—45 larvæ of bark-boring beetles (Scolytidae); 1 small spider.

425. Male; *Tarvin, Chester*; 9th May, 1898.—Many larvæ of bark-boring beetles (Scolytidae); 1 small larva of wood-boring beetle (*Rhagium*); 1 Dipterous larva.

Summary.—2 contained insects of the injurious group; 1, indifferent group; 1, a spider.

426. Field Notes.—In July, 1907, a male of this beautiful species paid frequent visits to a wood-stack at Crickleigh Farm,

Gloucester. The timber was of various kinds, but the ash predominated, and this was swarming with the larvæ of the bark-boring beetle, *Hylesinus faxini*. Quite two-thirds of these had been eaten, and it was extremely interesting to see with what rapidity the bird chiselled away the bark with its powerful bill in order to extract the insects from their burrows. The bird was remarkably tame, and seemed perfectly regardless of the presence of a small boy who was engaged in chopping sticks within 20 paces of its feeding ground.

GREEN WOODPECKER (*Gecinus viridis*, Linn.).

427. Female; Oakmere, Cheshire; 20th February, 1895.—Fragments of 1 earwig (*Forficula* sp.). This bird was found dead; it had died probably from the intense cold, which had cut off its food supply.

428. Female; Flintshire; 10th April, 1897.—Filled with ants and their larvæ (*Formica* spp.).

429, 430. 2 Immature; Cheshire; August, 1903.—Both examples were filled with the small yellow ant (*Formica flava*).

431. Male; near Gloucester; November, 1901.—23 earwigs (*Forficula* sp.) and a large number of black ants (*Formica fusca*).

432. Female; Manley, Cheshire; 17th December, 1888.—A few fragments of beetles; a quantity of fine sand.

Summary.—2 contained insects of the injurious group; 4. indifferent group.

433. *Field Notes.*—In the forest of Delamere, Cheshire, the larvæ and imagines of the common Longicorn Beetle, *Rhagium bifasciatum*, are very keenly sought for, and nearly all the decayed fir trees harbouring this insect are found drilled and excavated by this bird. In the same locality the dead limbs of the oak and rough posts and railings are also often stripped for the larvæ of beetles (*Astynomus edilis*, &c.), which they sometimes harbour. Delamere is also the resort of one of the birch-feeding Clearwing Moths (*Sesia culiciformis*), the larvæ of which usually affect the cut ends of the birch stumps; and in searching for these insects I repeatedly found that they had been extracted from the branches by wood-peckers, more especially was this the case where the stumps were large and well exposed. During the warmer months of the

year ants form a large portion of the dietary of this bird. It is not often that one has the opportunity of observing these birds feeding at close quarters, but by effectually concealing myself I had the pleasure of watching a male and female extract ants from their "hills" or nests on many occasions during six consecutive days. This was at Crickleigh, near Gloucester, in the month of August, 1904; and I noticed also that the birds often searched among the grass evidently for other insects, though what the exact nature of these were I could not ascertain, although I was within 15 paces and was watching them through a pair of Goertz binoculars. The ant-hills in this particular locality were made in stiff clayey soil, so that the holes drilled in them by the birds remained intact for many days.

KINGFISHER (*Alcedo ispida*, Linn.).

434. ? Sex; Cheshire; 8th January, 1905.—Completely empty; mucous lining of a distinct greenish colour.
435. ? Sex; Cheshire; 22nd January, 1905.—1 small gudgeon, (*Gobio fluviatilis*); many minute fish bones.
436. Male; Cheshire; October, 1904.—Completely filled with small fish bones.
437. ? Sex; Cheshire; 9th October, 1901.—Remains of several Water Boatmen (*Notonecta glauca*); a few small fish bones.
438. ? Sex; Cheshire; 15th October, 1901.—A mass of small fish bones.
- 439, 440. 1 Male; 1 Female; Flintshire; November, 1903.—Both filled with small fish bones.
441. ? Sex; Cheshire; November, 1903.—Mass of small fish bones.
442. 2 ? Sex; Flintshire; 28th November, 1904.—Both examples completely filled with small fish bones.
443. ? Sex; near Chester; 1st December, 1893.—Filled with minute fish bones.
444. ? Sex; Cheshire; December, 1899.—A mass of small fish bones.
- 445, 446. 2 Males; Dee Estuary; December, 1903.—Both completely empty.
447. ? Sex; near Chester; December, 1899.—Completely filled with small fish bones.

448. ? Sex; *Flintshire*; 2nd December, 1904.—Partly filled with small fish bones.

449. ? Sex; *Cheshire*; 16th December, 1890.—Completely filled with fish bones.

450. ? Sex; *near Chester*; 18th December, 1904.—Filled with small fish bones.

451. ? Sex; *Flintshire*; 24th December, 1904.—Filled with small fish bones.

452. 2 ? Sex; *Flintshire*; ? date.—Both filled with minute fish bones.

Summary.—1 contained insects of the beneficial group; 18, fish remains.

HOOPOE (*Upupa epops*, Linn.).

453. Male; *Saltney, Chester*; 29th August, 1906.—Stomach completely filled with the skins of moth larvæ, consisting of 17 small Noctuids, 15 large Noctuids of the Mamestrid type (possibly *Mamestra brassicae*), and 2 Hepialid larvæ (Swift Moths); 1 large fragment of cinder. The contents of the stomach of this bird were recorded* as the larvæ of a species of *Tipula* ("leather jackets"), which they much resembled until they were restored in potash.

Summary.—Contained insects of the injurious group only.

CUCKOO (*Cuculus canorus*, Linn.).

454. Female; *near Chester*; 15th April, 1895.—4 weevils (*Sitones sulcifrons* and *Sitones* sp.); 1 Geodephagous beetle (*Pterostichus striola*); 12 full-fed larvæ of the Drinker Moth (*Cosmotriche potatoria*) and fragments of others; 3 nearly full-fed larvæ of *Lasiocampa quercus*; many fragments of Coleopterous insects.

455. ? Sex; *Cheshire*; 27th April, 1903.—Filled with a black pulverised mass of spinose hairs, mandibles, thoracic sclerites, &c., of a Lepidopterous larva; evidently all of the same species. The remains are unlike those of any British species, and it is highly probable that they are of tropical origin. There was also a piece of knotted string about 2 inches in length, and a comparatively large, flat, waterworn fragment of rock.

456. *Female*; near Chester; 10th May, 1894.—Almost filled with the larvæ of a sawfly (possibly a species of *Lophyrus*), about 1 inch in length, greenish-blue with shining black heads and numerous plates on the segments. A few fragments of weevils (*Strophosomus* sp., &c.) ; a quantity of clean sand.

457. *Female*; near Chester; 24th May, 1889.—Filled with moth larvæ (Geometrids), of which many were those of the Magpie Moth (*Abraxas grossulariata*) ; fragments of 1 weevil.

458. *Female*; Saighton, Chester; 24th May, 1889.—Many larvæ of Magpie Moth (*Abraxas grossulariata*) and other Geometrid and Noctuid moth larvæ ; remains of 1 beetle (Curculionidae).

459. *Female*; Whitchurch, Salop; 24th May, 1895.—2 full-fed larvæ of Magpie Moth (*Abraxas grossulariata*) ; 90 larvæ of Gooseberry Sawfly (*Nematus ribesii*) ; many fragments of egg of Meadow Pipit ; 3 fragments of coal.

460, 461. 2 ? Sex; Upwell, Cambs.; May, 1879.—Both examples had their stomachs distended with the larvæ of the Gooseberry Sawfly (*Nematus ribesii*). There was a great outbreak of "gooseberry grubs" at the time, and as some of the fruit growers were under the impression that the cuckoos were feeding upon the larvæ, the birds were shot to confirm their statements.

462. *Male*; near Chester; 4th June, 1894.—Filled with sawfly larvæ of a uniform pale green colour, with pale brownish-yellow heads and black eye-spots, 7 to 8 lines long. Remains of 3 specimens of *Pterostichus* ? *vulgaris*.

463. *Male*; near Chester; 11th June, 1889.—Remains of many beetles (*Carabus* sp., *Amara* sp., *Pterostichus* sp.) ; several heads of moth larvæ ; a few bud scales.

464. *Fledged young*; Aldford, Chester; 28th July, 1898.—2 larvæ of a Syrphid fly (*Syrphus* sp.) ; 3 egg cases of earthworms ; 4 seeds of a cruciferous plant ; 3 examples of the weevil *Otiorrhynchus sulcatus* ; 1 small red bud. There was besides these a mass of minute fragments of Coleopterous and Dipterous insects.

465. *Male*; Cheshire; July, 1891.—Remains of Geodephagous beetles (*Pterostichus striola*) ; a small quantity of sand ; 2 pebbles.

466. *Fledged young*; near Chester; July, 1903.—A small
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pellet, about the size of a filbert, of tightly packed grass mixed with blackish hairs from the larvæ of some Lepidopterous insect (? Bombycidæ).

467. *Fledged young*; *Delamere, Cheshire*; *3rd September, 1904*.—14 larvæ of the moth *Hadena pisi*; 1 larva of the Buff Ermine Moth (*Spilosoma lubricipeda*). No hairs on stomach wall as in adults, which had been feeding on hairy caterpillars.

468. ? Sex; *Wallasey, Cheshire*; *July, 1888*.—Wing cases of several Coccinellid beetles (*Hippodamia variegata*, Goeze); several partly digested skins of moth larvæ.

Summary.—13 contained insects of the injurious group; 6, beneficial group; 5, indifferent group; 1, eggs of earth-worm; 1, egg shell of Meadow Pipit; 2, bud scales; 1, seeds.

BARN OWL (*Strix flammea*, Linn.).

469. ? Sex; *Mollington, Chester*; *1st April, 1905*.—Stomach almost filled with a fine grey silty soil.

470. ? Sex; *Cheshire*; *September, 1901*.—1 Common Shrew (*Sorex vulgaris*).

471. ? Sex; *Cheshire*; *4th September, 1904*.—1 dung beetle (*Geotrupes vernalis*).

472. ? Sex; *Cheshire*; *11th September, 1904*.—1 Common House Mouse (*Mus musculus*); 1 House Sparrow.

473. ? Sex; *Cheshire*; *11th September, 1904*.—2 Field Voles (*Microtus agrestis* (Linn.)).

474. ? Sex; *Cheshire*; *12th September, 1904*.—1 Long-tailed Field Mouse (*Mus sylvaticus*); remains of 2 Long-eared Bats (*Plecotus auritus*); remains of 3 beetles (*Geotrupes* sp., *Pterostichus* sp. and a small weevil); 1 Noctuid moth.

475. ? Sex; *Cheshire*; *October, 1903*.—4 Field Voles, all partly digested.

476. ? Sex; *Cheshire*; *November, 1903*.—1 Sparrow.

477. ? Sex; *Flintshire*; *November, 1902*.—1 Green Finch.

478. ? Sex; *Cheshire*; *3rd November, 1903*.—1 Bank Vole (*Evotomys glareolus* (Shrib.)); 4 Common Shrews. The vole had been almost completely digested, the shrews were practically intact and freshly killed.

479. ? Sex; *Flintshire*; *December, 1903*.—3 Field Voles, partly digested.

480. ? Sex; *Cheshire*; ? date.—2 freshly caught Field Voles.

Four examples examined 15.V.89, 9.II.95 and 28.X.03, were found empty.

Summary.—1 contained insects of the injurious group; 1, beneficial group; 2, indifferent group; 5, voles; 2, mice; 2, shrews; 1, bats; 3, birds.

LONG-EARED OWL (*Asio otus* (Linn.).

481-483. 3 Pellets; *Burton, Cheshire*; 25th March, 1903.—

(a) 1 House Sparrow; 1 Field Vole. (b) 1 House Mouse (*Mus musculus*). (c) 1 Skylark.

484-486. 3 Pellets; *Delamere, Cheshire*; April, 1903.—4 Field Voles; 1 bird (sp. non det.).

487. ? Sex; *Cheshire*; August, 1903.—1 Yellow Bunting; 1 Long-tailed Field Mouse.

488. 14 Pellets; *Crickleigh, near Gloucester*; August, 1901.—1 Mole (*Talpa europeæ*); 7 Shrews; 4 Long-tailed Field Mice; 1 Blackbird. 8 of the pellets were composed entirely of the remains of the large dung beetles, *Geotrupes stercorarius* and *G. spiniger*, mixed with grass. The remains of these insects occurred also in 3 of the other pellets.

489. ? Sex; *Burton, Cheshire*; September, 1903.—Remains of the dung beetle *Geotrupes* sp.

490. Female; *Whitchurch, Salop*; 26th September, 1901.—Field Vole; fragments of the dung beetle *Geotrupes* sp.; 1 weevil (*Cleonus* ? *sulcirostris*).

491. ? Sex; *Cheshire*; 26th September, 1901.—2 Field Voles.

492. ? Sex; *Cheshire*; November, 1903.—1 Geodephagous beetle (*Pterostichus striola*); 1 Field Vole.

493. ? Sex; *Cheshire*; 8th December, 1904.—Decomposed feathers of a bird.

Summary.—1 contained insect of beneficial group; 13, indifferent group; 1, mole; 8, voles; 6, mice; 7, shrews; 6, birds.

SHORT-EARED OWL (*Asio accipitrinus* (Pallas)).

494. Female; *Oakmere, Cheshire*; 12th January, 1889.—1 Field Vole.

TAWNY OWL (*Syrnium aluco* (Linn.)).

495. *Cheshire*; March, 1903. 2 Field Voles.

496. Male; *Derbyshire*; 22nd January, 1894.—A few small earthworms; a quantity of grass and a few pebbles.

497. ? Sex ; Flintshire ; 23rd January, 1905.—Remains of a Blackbird ; hair of Vole ; fragments of Geodephagous beetles.

498. Female ; Eaton, Chester ; 22nd March, 1894.—Remains of 1 Water Vole (*Microtus amphibius*, Linn.) and 1 Long-tailed Field Mouse.

499. ? Sex ; Eccleston, Chester ; 26th April, 1904.—A portion of the wing of a Blackbird and 1 Common Shrew.

500. ? Sex ; Aldford, Chester ; 26th April.—1 Long-tailed Field Mouse ; several large dung beetles (*Geotrupes spinipes*) ; and a small quantity of grass.

501. Female ; Great Witcombe, Gloucester ; July (4th week), 1903 ; killed at 6 a.m.—Several grey slugs (*Limax agrestis*) ; 3 Noctuid moths ; some blades of grass. The slugs were freshly caught and quite intact.

502. ? Sex ; Cheshire ; September, 1904.—1 Starling.

503. Male ; Moelfra, North Wales ; 3rd December, 1894.—A brown fluid (?) digested worms), soil and a quantity of a lime-like substance resembling mortar.

504. Female ; Flintshire ; 8th December, 1904.—Fur of small mammal (no bones) ; vegetable matter (?) grass).

505-508. 4 Pellets ; Burton, Cheshire ; 11th May, 1904.—2 Bank Voles ; 4 Field Voles ; 3 Common Shrews ; 1 Long-tailed Field Mouse.

509-522. 14 Pellets ; Colomendy, Mold ; 17th May, 1902.—5 House Sparrows ; 8 Long-tailed Field Mice ; 15 Water Shrews (*Crossopus fodiens*) ; 1 Common Shrew ; 1 Blackbird ; remains of *Geotrupes* sp. in several of the pellets.

523-570. 48 Pellets ; Eaton, Chester ; 23rd May, 1895.—10 skulls of Field Vole ; 4 skulls of Water Vole ; 1 skull of House Mouse ; 6 skulls of Long-tailed Field Mouse ; 38 skulls of Common Shrew ; 25 skulls of House Sparrow ; 1 skull of Thrush ; 1 skull of Bunting (? Yellow Bunting).

571, 572. 2 Pellets ; Charlton, Chester ; 27th September, 1902.—3 Common Shrews ; feathers of Blackbird ; skull of House Sparrow.

573-576. 4 Pellets ; Eaton, Chester.—(a) 4 Shrews and 1 Field Vole. (b) 2 House Sparrows and 1 Shrew. (c and d) 2 Shrews and 4 Field Voles.

577-579. 3 Pellets ; Eaton, Chester ; January, 1903.—(a) 2 Common Shrews ; 1 Field Vole. (b) 2 Field Voles. (c) 1 Bank Vole.

Summary of stomach contents.—1 contained insects of the injurious group; 1, indifferent group; 1, beneficial group; 1, worms; 1, slugs; 3, grass; 3, voles; 2, mice; 1, shrews; 3, birds.

Summary of 75 pellets.—29 voles; 16 mice; 69 shrews; 37 birds; remains of dung beetles (*Geotrupes*) in a few instances.

HEN-HARRIER (*Circus cyancus* (Linn.).

580. *Female*; *Saughall, Chester*; *5th November, 1897*.—1 Skylark; 2 Meadow Pipits; a single feather of the Teal and another feather very like that of a Partridge (? the remains of a previous meal). The prey had been partly denuded of the feathers.

COMMON BUZZARD (*Buteo vulgaris*, Leach).

581. *Female*; *Arenig, Bala*; *9th September, 1902*.—Remains of a Grouse.

582. ? *Sex*; *Cheshire*; *Autumn, 1903*.—Remains of a Moorhen, consisting of an entire foot and part of the tarsus, several short bones and a number of feathers.

583. ? *Sex*; *Eaton, Chester*; ? date.—Remains of Brown Rat (*Mus decumanus*) and Skylark.

Summary.—3 contained remains of birds; 1, a rat.

SPARROW HAWK (*Accipiter nisus* (Linn.).

584. *Male*; *Cheshire*; *3rd March, 1894*.—Remains of Thrush.

585. *Male*; *Ince, Chester*; *13th April, 1894*.—Remains of male Bullfinch (lower mandible, legs, and feathers of breast, &c.).

586. *Male*; *near Chester*; *15th May, 1889*.—Remains of Finch (sp. incert.).

587. ? *Sex*; *Eaton, Chester*; *16th May, 1889*.—Remains of 3 young birds (nestlings), not determinable.

588. *Female*; *Eaton, Chester*; *6th June, 1901*.—Remains of 1 Skylark.

589. *Male*; *Cheshire*; *14th June, 1892*.—Remains of Warbler (sp. incert.).

590. *Female*; *Eaton, Chester*; *6th June, 1891*.—Remains of Blackbird.

591-597. 7 Pellets; Eaton, Chester; 2nd June, 1894.—Remains of 7 Willow Wrens.

598. ? Sex; Cheshire; July, 1904.—4 half-grown frogs; remains of several grasshoppers; a few fragments of Coleoptera (sp. incert.).

599. Male; Cheshire; 14th July, 1892.—Warbler (sp. incert.).

600. Male; Cheshire; October, 1901.—Remains of Blue Tit.

601. Female; Shotwick, Cheshire; 21st November, 1889.—Remains of small bird (sp. incert.).

602. Female; Bala; 10th December, 1904.—Remains of Starling (1 leg and foot, portion of 1 wing, many feathers).

Summary.—1 contained insects of the indifferent group; 11, birds; 1, frogs.

Summary of 7 Pellets.—7 birds.

PEREGRINE FALCON (*Falco peregrinus*, Tunstall).

603. ? Sex; Eaton, Chester; 17th January, 1890.—Remains of Redwing.

604. Male; Eaton, Chester; 3rd March, 1895.—Remains of Starling.

605. ? Sex; Cheshire; 1st December, 1890.—Fur of small mammal (mouse, vole or rat).

Summary.—2 contained remains of birds; 1, mammal.

Field Notes.—Mr. S. G. Cummings, of Chester, showed me several feathers from a Grouse which he found on the rocks near the nest of this bird at Carmel Head, Anglesey.

MERLIN (*Falco æsalon*, Tunstall).

606. Male; Anglesey; 5th May, 1891.—Remains of male Bullfinch.

607. Female; Arenig, near Bala; 15th May, 1901.—Remains of 2 Meadow Pipits.

608. Female; near Bala; 25th July, 1896.—Remains of 3 Meadow Pipits.

609. Female; Dee Marshes; September, 1903.—Remains of 1 Reed Bunting, 1 Blue Tit.

610. Male; Arenig, near Bala; 8th December, 1896.—1 Linnet (*Linota cannabina*).

611. Female; *Arenig, near Bala*; 8th December, 1896.—Remains of 3 Greenfinches.

612. Female; *Ince, Cheshire*; December, 1899.—Remains of Chaffinch.

Summary.—All the 7 examples contained the remains of small birds.

KESTREL (*Falco tinnunculus*, Linn.).

613. ? Sex; *Cheshire*, 11th March, 1904.—Remains of Hedge Sparrow (*Accendor modularis*) (feet broken off at base of tarsal segment).

614. Female; *Ince, Cheshire*; 9th April, 1891.—12 earth-worms.

615. Male; *near Chester*; 15th April, 1889.—Contained the remains of 3 young birds (nestlings).

616. Male; *Cheshire*; 18th April, 1884.—2 Field Voles.

617. Male; *Aldford, Chester*; 18th April, 1894.—1 Long-tailed Field Mouse.

618. Male; *near Chester*; 20th April, 1894.—1 Field Vole. This bird was said to have been shot while in the act of eating a young rabbit!

619. Female; *Aldford, Chester*; 24th April, 1894.—2 Field Voles; remains (feathers) of Starling; the dung beetle, *Geotrupes stercorarius*.

620. Male; *Eaton, Chester*; 6th May, 1901.—Remains of 2 Field Voles.

621. Male; *near Chester*; 15th May, 1889.—Remains of young bird (nestling).

622-624. 3 Young; *Cheshire*; 23rd June, 1894.—3 Field Voles (1 in each). Parent (No. 625) contained remains of Meadow Pipit.

625. Female; *Cheshire*; 23rd June, 1894.—Remains of Meadow Pipit.

626. Female; *Delamere, Cheshire*; August, 1902.—2 partly-grown frogs.

627. Female; *Flintshire*; 24th September, 1901.—Filled with the remains of large dung beetles (*Geotrupes stercorarius* and *G. spinipes*).

628. Male; *Cheshire*; 27th September, 1902.—Bones of 1 Vole (? *Microtus agrestis*); many fragments of the beetle *Geotrupes* sp.

629. ? Sex; *Dee Marshes, Cheshire*; November, 1904.—Remains of Starling.

630, 631.—2 Females; *Eaton, Chester*; 23rd November, 1894.—Remains of 3 Field Voles in one, in the other 1 *M. agrestis* and 1 *E. glareolus*.

632–638. 7 Pellets; *Ince, Chester*: October, 1893.—Remains of 9 Field Voles; remains of the dung beetle *Geotrupes* sp. in 5. These pellets were found on the ground beneath a favourite roosting place of the Kestrel—a ledge beneath the overhanging eaves of a country mansion, to which the birds had resorted year after year for a number of years.

639–688. 50 Pellets; *Aldford, Chester*; 21st April, 1894.—Remains of 53 Field Voles, 1 Bank Vole and remains of a Blackbird. These were taken from a nest containing 4 fully-fledged young.

Summary of Stomach Contents.—3 contained insects of the indifferent group; 9, voles; 1, mice; 1, frogs; 6, birds.

Summary of 57 Pellets.—62 voles; 1 bird; 5 indifferent insects.

COMMON HERON (*Ardea cinerea*, Linn.).

689. Female; *Trafford, Cheshire*; 7th March, 1895.—Remains of Water Vole (*Microtus amphibius*, Linn.).

690. ? Sex; *Cheshire*; 11th October, 1901.—1 Common Shrew (*Sorex vulgaris*), several Water Boatmen (*Notonecta glauca*); many blades of grass.

691. Male; *Saltney, Chester*; 1st December, 1893.—1 adult Water Vole; many small fish bones.

692–705. 14 Pellets; *Eaton, Chester*; April to June.—All these pellets consisted of the fur (very few bones) of the Water Vole (*M. amphibius*); with a few wing cases of beetles, *Dytiscus marginalis* and *Geotrupes stercorarius*, and the Water Boatman (*Notonecta glauca*).

706–708. 3 Pellets; *Tabley Park, Cheshire*; 21st March, 1903.—Fur of Water Vole (*M. amphibius*); 1 water beetle (*Dytiscus marginalis*).

Summary.—1 contained insects of the indifferent group, 2, voles; 1, shrew; 1, fish; 1, grass.

Summary of 17 Pellets.—All consisted of the remains (chiefly fur) of the Water Vole, mixed with a few remains of beetles of the indifferent and beneficial groups.

BITTERN (*Botaurus stellaris* (Linn.).

709. Female; near Combermere, Cheshire; 2nd February, 1905.—A small pellet of the hair of the Water Vole.

710. Male; Tycroes, Anglesey; 18th December, 1899.—2 small pellets of the hair of the Water Vole; many fragments of Water Boatmen (*Notonecta glauca*) and blades of grass.

711. Male; Tarporley; Cheshire; 24th January, 1893.—Filled with the remains of frogs, 3 of which were nearly perfect. (These must have been dug out of their winter retreats.)

Summary.—2 contained voles; 1, frogs; 1, insects of the indifferent group.

COMMON CRANE (*Grus communis*, Bechst.).

712. Female; Rhosneigr, Anglesey; 16th May, 1908.—Stomach almost filled with equal proportions of pebbles and grit and large Tipulid larvæ (*Tipula oleracea*), of which 54 were almost perfect, the largest measuring 1½ in. in length. Besides these there were also the head and thorax and wing cases of 4 Elaterid beetles (*Agriotes* sp.), a freshly caught larva belonging to the same group, though, apparently, not of the same genus. Fragments of the dung beetles (*Aphodius fimetarius* and *Geotrupes* sp.), and 2 glumes from oat grains. The last named were in all probability taken accidentally with the dung beetles. The grit and pebbles weighed when dried 15½ grammes.

PINK-FOOTED GOOSE (*Anser brachyrhynchus*, Baillon).

713. ? Sex; Dee Estuary; 17th January, 1893.—Grass and a few small pebbles.

714. ? Sex; Tattenhall, Cheshire; 18th December, 1890.—Grass and sand.

WHOOPER SWAN (*Cygnus musicus*, Bechstein).

715. Male; Anglesey; 26th December, 1890.—A small quantity of grass and sand; bird in extremely poor condition.

PINTAIL (*Dafila acuta* (Linn.).

716. Male; Eaton, Chester; 26th December, 1890.—Filled with acorns.

TEAL (*Nettion crecca* (Linn.).

717. *Male*; *Eaton, Chester*; *15th January, 1895*.—Many seeds of a species of *Carex* and a quantity of sand.

718. *Male*; *Eaton, Chester*; *13th March, 1895*.—Many small seeds (*Carex* sp., &c.) ; vegetable fibre ; sand.

719. *Female*; *Anglesey*; *March, 1905*.—Filled with green algæ.

720. *Male*; *Cheshire*; *19th May, 1905*.—Partly filled with the larva of *Tynapus* sp.

721, 722. 2 *Males*; *Lincolnshire*; *15th December, 1904*.—About equal proportions of sand and vegetable matter (grass, &c.).

GOLDEN EYE (*Clangula glaucion* (Linn.).

723. *Male, jun.*; *Dee Marshes, Cheshire*; *19th January, 1894*.—Remains of over 150 specimens of the beetle *Helophorus aquaticus* ; 1 *Dytiscus punctulatus* ; no pebbles or sand.

724. *Male*; *Eaton, Chester*; *5th December, 1889*.—Algæ and pebbles.

WIDGEON (*Mareca penelope* (Linn.).

725. *Burton, Cheshire*; *23rd December, 1890*.—A quantity of grass and sand.

726. *Male*; *Dee Estuary, Cheshire*; *16th February, 1901*.—Vegetable fibre and sand.

SHOVELER (*Spatula clypeata* (Linn.).

727. *Knutsford, Cheshire*; *16th February, 1901*.—Large grains of quartzite sand.

COMMON SHELD-DUCK (*Tadorna cornuta* (S. G. Gmelin)).

728. *Male*; *Prestatyn, North Wales*; *16th May, 1894*.—A large quantity of fragments of the shell *Tellina balthica* and 3 rather large pebbles.

729. *Female*; *Talacre, North Wales*; *21st May, 1894*.—Filled with equal parts of sand and the shells of *T. baltica*.

730, 731. 2 *Males*; *Burton, Chester*; *20th December, 1890*.—Both contained broken shells of *Tellina balthica* and algæ.

MALLARD (*Anas boscas*, Linn.).

732, 733. *Male and Female*; *Cheshire*; *13th March, 1895*.—Both contained a quantity of barley and oats ; fragments of

shells of *Tellina balthica*. These birds had been fed by the keeper with corn for a few days.

734. *Male*; *Cheshire*; *Winter, 1903*.—Between 300 and 400 seeds of the goose grass (*Galium Aparine*).

COMMON POCHARD (*Fuligula ferina* (Linn.).

735. *Male*; *Manley, Cheshire*; *12th January, 1889*.—Grass; worms; pebbles.

TUFTED DUCK (*Fuligula cristata* (Leach)).

736. *Eaton, Chester*; *26th December, 1890*.—Fruit of the hawthorn (*Crataegus*) ; grass ; vegetable fibres ; small pebbles.

SCAUP DUCK (*Fuligula marila* (Linn.).

737. *Male*; *Estuary of Dee*; *14th November, 1888*.—Broken fragments of cockle shells (*Cardium edule*) and a few pebbles.

COMMON SCOTER (*Edemicia nigra* (Linn.).

738. *Female*; *Oakmere, Cheshire*; *14th November, 1889*.—Nothing but sand.

EIDER DUCK (*Somateria mollisima* (Linn.).

739. *Female*; *Aldford, Chester*; *3rd December, 1894*.—Filled with remains of beetles (*Hydradephaga, Geodephaga*).

740. *Female*; *Aldford, Chester*; *11th November, 1895*.—Contained no food.

Summary of the contents of 22 ducks, representing 13 different species.—3 contained insects of the indifferent group ; 1, beneficial group ; 10, grass and other vegetable matter ; 3, seeds ; 1, berries ; 1, acorns ; 2, grain ; 6, molluscs ; 1, worms.

SMEW (*Mergus albellus*, Linn.).

741. *Male*; *River Dee, Chester*; *14th January, 1891*.—A few small fish bones.

742. *Male*; *River Dee, Chester*; *14th January, 1891*.—10 small Flukes (*Platessa flesus*) ; 1 Salmon ; a few Sand-hoppers ; many small fish bones.

743. *Female*; *River Dee, Chester*; *14th January, 1891*.—5 young Flukes ; 1 Sandhopper ; many small fish bones.

744. *Male*; *Ince, Chester*; *2nd February, 1895*.—Many small fish bones.

RED-BREASTED MERGANSER (*Mergus serrator*, Linn.).

745. *Female*; *Eaton, Chester*; *5th December, 1889*.—5 small Roach (*Leuciscus rutilus*) ; 2 Gudgeon (*Gobio fluviatilis*) ; quantities of small fish bones. This bird was perfectly engorged, the fish filling both gullet and stomach.

GOOSANDER (*Mergus merganser*, Linn.).

746. *Female*; *Dee Estuary*; *6th January, 1890*.—Many small fish (partly digested). This example also contained several small thread-worms (*Filaria*) which showed signs of life 6 or 7 days after the bird had been shot.

747. *Male*; *River Dee, near Chester*; *9th January, 1894*.—3 young Salmon, freshly caught, and remains of other small fish.

Summary of the contents of the 3 species of Mergus.—1 contained Gudgeon; 1, Roach; 2, Salmon; 2, Flukes; 5, undeterminable fish remains; 2, Sandhoppers.

QUAIL (*Coturnix communis*, Bonnaterre).

748. ? *Sex*; *Rhyl, Flintshire*; *11th August, 1893*.—Chiefly seeds of the field brassica (*Brassica campestris*) ; a few seeds of perennial ryegrass (*Lolium perenne*) ; seeds of black bindweed (*Polygonum Convolvulus*).

WATER-RAIL (*Rallus aquaticus*, Linn.).

749. *Male*; *near Chester*; *3rd January, 1890*.—Freshwater molluscs (*Planorbis* sp., *Bythinia tentaculata*) ; many fragments of beetles (Hydradephaga, Geodephaga, Rhyncophora) ; pebbles.

750. *Male*; *Colwyn Bay*; *3rd January, 1890*.—Molluscs (*Helix rotundata*, *Pisidium* sp.) ; pebbles.

751. ? *Sex*; *Yorkshire*; *20th January, 1904*.—26 fruits of ivy; 2 land shells (*Zonites* sp.) ; fragments of water bugs (*Notonecta*, sp.).

752. ? *Sex*; *Aldford, Chester*; *4th February, 1890*.—Small land shells (*Helix* sp.) and pebbles.

753. *Male*; *Vicar's Cross, Chester*; *13th November, 1888*.—Vegetable matter only (grass, &c.).

754. ? Sex ; Sealand, Chester ; 24th November, 1894.—9 seeds of the dog rose (*Rosa* sp.) ; 1 seed of knapweed (*Centaurea*) ; caddis worms (*Phryganeidae*) ; 2 small pebbles ; sand.

755. Female ; Eaton, Chester ; December, 1899.—A large quantity of vegetable fibres, &c. ; seeds of *Carex*, sp. ; 3 fragments of coal.

756. Male ; Aldford, Chester ; 8th December, 1896.—Beetles (*Bembidium* ? *stomoides* ; 1 *Staphylinus pubescens* ; 1 Halticid).

757. ? Sex ; Blacon, Chester ; 24th December, 1890.—1 wheat grain ; grass and some unidentified seeds.

Summary.—2 contained insects of the injurious group ; 4, beneficial group ; 1, indifferent group ; 4, molluscs ; 3, seeds ; 1, berries ; 1, grain ; 3, grass and unidentified vegetable matter.

SPOTTED CRAKE (*Porzana maruettta* (Leach)).

758. ? Sex ; near Chester ; October, 1888.—Many rudimentary shells of slugs (*Limacidae*).

759. Male ; Oakmere, Cheshire ; 3rd October, 1889.—Seeds of an unidentified plant ; many quartz pebbles.

760. ? Sex ; near Chester ; 13th October, 1888.—Skins of moth larvæ (Noctuids) ; fragments of Geodephagous beetles (*Bembidium* spp., *Harpalus* sp.) ; seeds of *Carex* sp. ; sand.

761. Male ; Cheshire ; 11th September, 1889.—Several skins of moth larvæ ; quartz pebbles.

Summary.—2 contained insects of the injurious group ; 1, beneficial group ; 1, slugs ; 3, seeds.

MOORHEN (*Gallinula chloropus*, Linn.).

762. Female ; near Chester ; 12th January, 1888.—A small quantity of sand.

763. Female ; Foreshore, Colwyn Bay ; 19th January, 1894.—A small quantity of sand.

764. ? Sex ; Yorkshire ; 14th March, 1904.—A large quantity of vegetable matter ; a few seeds of *Ranunculus* sp. ; a large quantity of sand ; a few pebbles. There was a larger proportion of sand than anything else.

765, 766.—2 Males ; Aldford, Chester ; 30th March, 1894.—A mass of vegetable matter and sand.

767. ? Sex ; near Chester ; 9th May, 1903.—Filled with equal proportions of grass and sand.

768. *Fledged young; Cheshire; 2nd September, 1904.*—Fruit of the blackberry.

Summary.—3 contained grass and other vegetable matter; 1, seeds; 1, berries; 2, sand only.

Coot (*Fulica atra*, Linn.).

769. *Male; Colwyn Bay; 19th January, 1894.*—An enormous quantity of sand, mixed with grass. This example was shot on the foreshore.

RINGED PLOVER (*Ægialitis hiaticula* (Linn.).

770. ? Sex; *Estuary of the Dee; October, 1903.*—Contained no food, but a large *Calculus* (8 by 5 mm.) of fine sand cemented together by calcareous matter.

GOLDEN PLOVER (*Charadrius pluvialis*, Linn.).

771. *Male; Saltney Marsh; Chester; 29th March, 1897.*—2 click beetles (*Agriotes* sp.); 1 weevil (*Curculionidæ*); a quantity of grass.

Summary.—Insects of the injurious group.

LAPWING (*Vanellus vulgaris*, Bechstein).

772, 773. 2 ? Sex; *near York; 20th January, 1904.*—Filled with equal proportions of broken fragments of *Telina* sp. and *Bythinia* sp.

774. *Male; Aldford, Cheshire; 11th May, 1894.*—1 earthworm; several mature larvæ of a Noctuid moth (? *Xylophasia polyodon*); a small quantity of vegetable matter (? grass).

775. *Female; Cheshire; 6th June, 1889.*—A few pebbles only.

776. *Female; near Bala; July, 1903.*—Many “leather jackets” (larvæ of *Tipula* sp.); pebbles.

777. ? Sex; *Dee Marshes; 8th September, 1903.*—Fragments of the beetles *Ocypus olens* and *Aphodius* sp.; many pebbles.

778. ? Sex; *Dee Marshes; 8th September, 1903.*—Fragments of 2 specimens of the dung beetle *Aphodius* sp.; many pebbles.

779. *Female; near Chester; 3rd November, 1888.*—1 wire-worm (*Agriotes* sp.); 1 earthworm; a small quantity of grass; pebbles.

780. ? Sex; *Dee Marshes; 14th November, 1889.*—Fragments of small mollusca (*Physa* sp., *Bythinia* sp.); sand.

781. ? Sex; Cheshire; 14th November, 1886.—Fragments of the shells of small land molluscs and sand.

782. ? Sex; Dee Estuary; December, 1904.—Nothing but pebbles and a little grass.

783. Male; near Chester; 18th December, 1888.—Fragments of Geodephagous beetles; 1 small earthworm; vegetable matter; pebbles.

Summary.—4 contained insects of the injurious group; 2, beneficial group; 2, indifferent group; 3, molluscs; 3, worms; 5, grass and other vegetable remains.

GREEN SANDPIPER (*Totanus ochropus*, Linn.).

784. Female; Barrowmore, Chester; 4th January, 1890.—Fragments of hydreadephagous beetles; remains of caddis worms (Phryganeidae); vegetable fibre; a few pebbles.

Summary.—Insects of the beneficial group and vegetable matter.

OYSTER CATCHER (*Hacmatopus ostralegus*, Linn.).

785. ? Sex; Prestatyn, Flint; 15th September, 1904.—Filled with vegetable matter; 2 angular stones.

WOODCOCK (*Scolopax rusticula*, Linn.).

786. Male; Aldford, Chester; 20th February, 1895.—Fragments of 1 earwig; 1 beetle (Geodephaga); a little sand. This bird was found dead.

Summary.—Insects of injurious and beneficial groups.

COMMON SNIPE (*Gallinago caelestis*, Frenzel).

787. ? Sex; Yorkshire; 8th February, 1904.—Chiefly grass (partly digested); 3 undeterminable seeds; a few quartz pebbles.

788. 2 ? Sex; Cheshire; 11th October, 1901.—(a) About equal proportions of grass and fragments of beetles (*Bembidium* spp., *Amara* sp., &c.); smooth pebbles. (b) Filled with grass, mixed with a few pebbles.

789. Female; near Chester; 25th October, 1888.—Fragments of small land shells (*Helix*); vegetable matter and sand.

790. Female; near Chester; 27th October, 1888.—Vegetable matter (chiefly grass) and a quantity of sand.

JACK SNIPE (*Gallinago gallinula*, Linn.).

791. *Male*; Aldford, Cheshire; 22nd March, 1897.—Almost entirely of weevils (in fragments); fragments of the beetle *Carabus* sp.; fragments of shells of *Tellina balthica*. The last named remains prove conclusively that this bird had either frequented the sea shore immediately prior to being shot, or that these shell fragments, taken in lieu of pebbles, had been retained for an indefinite period.

792. ? Sex; Cheshire; October, 1901.—Grass; minute fragments of beetles (Rhynchophora, Geodephaga); sand; round pebbles.

793. *Female*; near Chester; 25th October, 1888.—Chiefly vegetable matter (? grass); 1 small land shell (*Helix* sp.).

794. *Male*; near Chester; 22nd November, 1888.—Vegetable matter; a few fragments of Geodephagous beetles.

Summary of the 2 species of Snipe.—2 contained insects of the injurious group; 4, beneficial group; 1, indifferent group; 1, seeds; 7, grass and unidentified vegetable matter; 4, molluscs.

CURLEW SANDPIPER (*Tringa subarquata* (Guldenstadt)).

795. ? Sex; Dee Estuary; 17th October, 1889.—Filled with fragments of small crustaceans (*Talitrus locusta* &c.), mixed with small pieces of coal.

DUNLIN (*Tringa alpina*, Linn.).

796. ? Sex; Lincolnshire; 15th December, 1904—A small quantity of fine sand and fragments of the shells of *Tellina balthica*.

SANDERLING (*Calidris arenaria*, Linn.).

797. ? Sex; Abergale, North Wales; 24th November, 1888.—Both examples filled with Sandhoppers (*Talitrus locusta*).

COMMON SANDPIPER (*Totanus hypoleucus* (Linn.)).

798. 1 *Male*; 1 *Female*; Oakmere, Cheshire; 10th June, 1890.—Female filled with fragments of beetles (Curculionidæ and Geodephaga). Male: stomach empty.

799. ? Sex; Mere, Cheshire; 29th August, 1903.—Fragments of caddis flies (Trichoptera), including 70 almost perfect

wings ; 1 black ant (*Lasius niger*) ; a few fragments of beetles (? *Bembidium* sp.) ; several more or less angular pebbles.

Summary.—Both contained insects of the beneficial and injurious groups.

GREENSHANK (*Totanus canescens* (J. F. Gmelin)).

800. *Female* ; *Burton Rocks, (Dee Estuary)* ; *31st August, 1891*.—Remains of Shrimps (*Crangon vulgaris*) and Sandhoppers (*Talitrus locusta*).

801. *Female* ; *Barrowmore, Cheshire* ; *4th December, 1890*.—Chiefly fragments of beetles (Geodephaga, Rhynchophora) ; vegetable matter ; a few pebbles.

Summary.—1 contained insects of the beneficial and injurious groups ; 1, crustaceans.

CURLEW (*Numenius arquata*, Linn.).

802. ? *Sex* ; *near York* ; *20th January, 1904*.—Filled with fragments of shells of *Tellina balthica* and many shells of *Bythinia* sp.

803. *Male* ; *Arenig, North Wales* ; *7th July, 1899*.—Filled with larvæ of a species of Crane Fly (*Tipula* sp.) ; fragments of the beetles *Geotrupes* sp. and 1 *Calathus cisteloides*.

804. ? *Sex* ; *Cheshire* ; *October, 1901*.—Many seeds of Knot grass (*Polygonum* sp.) ; grass ; pebbles.

Summary.—1 contained insects of the injurious and beneficial groups ; 1 mollusca ; 1, seeds.

WHIMBREL (*Numenius phœopus* (Linn.).

805. ? *Sex* ; *Thornton, Cheshire* ; *18th May, 1904*.—9 large larvæ of the Crane Fly (*Tipula* sp.) ; many large angular pebbles.

806. *Male* ; *Dee Marshes* ; *28th August, 1895*.—Many larvæ and pupæ of the Crane Fly (*Tipula* sp.) ; over 40 earwigs (*Forficula* sp.) ; 3 beetles (2 *Pterostichus striola*, 1 Staphylinid).

Summary.—2 contained insects of the injurious group ; 1, beneficial group ; 1, indifferent group.

LITTLE TERN (*Sterna minuta*, Linn.).

807, 808. 2 *Females* ; *Prestatyn, North Wales* ; *16th May, 1894*.—Remains of small fish.

809, 810. 3 Males; *Criccieth, North Wales*; 22nd May, 1899.—All 3 contained small fish bones.

ARCTIC TERN (*Sterna macrura*, Naumann).

811, 812. 2 Males, 4 Females; *Anglesey*; 14th June, 1893.—All 6 examples contained small fish bones.

ROSEATE TERN (*Sterna dougalli*, Montagu).

813, 814. 2 Males, 1 Female; *Anglesey*; 14th June, 1893.—All 3 contained the bones of small fish; 1 contained a small flat stone.

815. 1 Male; *Anglesey*; 11th July, 1900.—Bones of small fish.

Summary of the 3 species of Tern.—All the 15 examples contained the remains of fish.

BLACK-HEADED GULL (*Larus ridibundus*, Linn.).

816-860. 45 Pellets; *Anglesey*; 2nd May, 1908.—36 consisted almost entirely of the remains of the common red dung beetle (*Aphodius fimetarius*); 1 contained 22 almost perfect examples* of the same species of *Aphodius*, 7 "rove beetles" (*Philonthus laminatus*, *P. politus* and *P. æneus*) and 2 Geodephagous beetles (*Loricera pilicornis*); 1 of equal proportions of the dung beetles *Geotrupes stercorarius* and *Aphodius fimetarius*, and grass; 1 the remains of 45 wire-worms (larvæ of *Agriotes ?lineatus*) mixed with a few minute fragments of *Geotrupes* sp.

861. ? Sex; *Dee Estuary*; 22nd September, 1904.—Remains of 2 dung beetles, *Geotrupes* sp.

862-896. 35 Pellets; *Dee Marshes*; 24th September, 1901. (See also Field Notes.)—Each pellet contained on an average the remains of 400 examples of Daddy-long-legs (*Tipula oleracea*); 1,600 ova of this insect were counted in 1 pellet.

897. ? Sex; *Cheshire*; 27th November, 1904.—Completely filled with shrimps.

* When found some of these insects showed evident signs of life, and twelve hours later several of them had recovered sufficiently to be able to walk about quite actively. They could not, therefore, have been retained in the bird's stomach or gullet for any length of time, and must have been voided prematurely owing to sickness or some other cause.

898. ? Sex; Cheshire; December, 1903.—Filled with grass and a few fragments of dung-feeding beetles (*Aphodius* spp.).

899. ? Sex; near Chester; 3rd December, 1904.—Remains of about 20 earthworms; a few blades of grass; 6 small pebbles.

Summary of stomach contents.—2 contained insects of the indifferent group; 1, crustaceans; 1, worms; 2, grass.

Summary of 80 Pellets.—36 contained insects of the injurious group; 1, beneficial group; 38, indifferent group.

Field Notes.—This Gull, more than any other, is often found inland at some distance from the sea, and it may frequently be seen associated with Rooks either following the plough or searching for food on cultivated land and pastures; moreover, the "gulleries" of this species are frequently at considerable distance from the coast, so that it is much more dependent upon the inland fauna for its food than any of its congeners; hence we find that its dietary consists of some of the commoner insects which are met with in its inland haunts. These are often captured during flight.

900. *Destruction of Crane Flies.*—Attention has already been given* to the enormous number of "leather jackets" which devastated the pasture-lands of the Dee Marshes in 1901. When the Crane Flies (*Tipula oleracea*) appeared these were attacked by flocks of Black-headed Gulls, "and to such an extent did they wage war against these insects that their 'pellets' or 'castings' were left scattered over the land in hundreds, looking like little bundles of tightly-packed dead grass. On soaking one of the 'pellets' in water it was found to contain the remains of about 400 Crane Flies and 1,600 of their eggs; the latter had evidently been taken while yet in the body of the parent. Each pellet probably represented a single meal, and there can be but little doubt that each bird would make at least ten meals daily of these insects. If this were so a single Gull would be accountable for the enormous number of 4,000 Crane Flies and their eggs per day, making an aggregate of 28,000 per week. As the Gulls flocked together in hundreds the number of insects which they devoured may better be imagined than described." Fortunately the birds were and are still strictly protected in this area.

* See Rook, p. 54.

COMMON GULL (*Larus canus*, Linn.).

901. ? Sex; near Chester; 25th January, 1905.—Remains of small fish.

902. ? Sex; Dee Estuary; 8th October, 1901.—A little grass; fragments of cockle shells (*Cardium edule*); small fish bones; grit.

Summary.—2 contained the remains of fish; 1, molluscs; 1, grass.

HERRING GULL (*Larus argentatus*, J. F. Gmelin).

903, 904. ? Sex; Colwyn Bay; 9th May, 1898.—Remains of small crustaceans; small fish bones.

905. ? Sex; Dee Estuary; 22nd September, 1904.—Filled with the remains of the edible and shore crab (*Portumnus depurator*).

906. ? Sex; Ince, Chester; December, 1886.—Foot and tarsal bone of the dog (in gullet).

Summary.—2 contained crustaceans; 1, carrion.

GREAT BLACK-BACKED GULL (*Larus marinus*, Linn.).

907. ? Sex; Colwyn Bay; 6th February, 1895.—Remains of small fish.

908-912. 5 Pellets; near Bodorgan, Anglesey; March, 1904.—Fragments (whorls) and epercula of the common whelk (*Fusus antiquus*) and shore crab (*Portumnus* sp.).

Summary.—1 contained fish remains; 1, molluscs; 1, crustaceans.

LESSER BLACK-BACKED GULL (*Larus fuscus*, Linn.).

913. ? Sex; Dee Estuary; December, 1889.—33 otoliths of fish and fragments of the shells of *Mya* ? *truncata*.

RAZORBILL (*Alca torda*, Linn.).

914. ? Sex; Abergale, N.W.; 21st January, 1894.—Empty. This example was found dead along the foreshore together with another Razorbill, the stomach of which was also empty.

915-917. 3 Young in down; Puffin Island; June, 1902.—All 3 examples contained a quantity of very small fish bones.

918. ? Sex; Dee Estuary; 6th December, 1888.—Remains of small fish.

GUILLEMOT (*Uria troile* (Linn.)).

919. ? Sex; Colwyn Bay; 6th December, 1888.—Remains of fish.

PUFFIN (*Fratercula arctica* (Linn.).

920, 921. 2 Males, 1 Female; St. Kilda, Western Hebrides; 3rd June, 1902.—Remains of small fish in all 3 examples.

922. Nestling in down; Puffin Island, Anglesey; 12th July, 1890.—A small quantity of algæ and some down from its own body.

RED-THROATED DIVER (*Colymbus septentrionalis*, Linn.).

923. Female; Dee Estuary; 6th December, 1888.—Remains of small fish partly digested.

924, 925. 2 ? Sex; Dee Estuary; 6th December, 1888.—Both filled with the remains of fish.

GREAT CRESTED GREBE (*Podiceps cristatus* (Linn.).

926. Female; Colwyn Bay (foreshore); 29th December, 1893.—Scales and bones of small fish; 63 feathers from its own breast and many fragments of others.

LITTLE GREBE OR DABCHICK (*Podiceps fluviatilis*, Tunstall).

927. ? Sex; Cheshire; 22nd January, 1905.—A few fragments of Hydradephagous beetles (*Agabus* sp., &c.); a few small fish bones.

928. ? Sex; Cheshire; 22nd January, 1905.—A few feathers from its own breast; 1 small plant stem. The mucous membrane of the stomach was stained green.

929. Young (in down); Cheshire; 1904.—3 caddis worms (larvæ of Phryganeidæ); 2 Water Boatmen (*Notonecta glauca*); many fragments of Hydradephagous beetles.

930. ? Sex; Cheshire; 5th December, 1889.—Plant remains and a few pebbles.

Summary.—2 contained insects of the beneficial group; 1, fish remains; 2, vegetable matter; 1, feathers.

LEACH'S FORK-TAILED PETREL (*Oceanodroma leucorrhœa* (Viellot)).

931-934. 4 Males, 1 Female; Boreray, St. Kilda; 5th June, 1902.—There was nothing in the stomachs of these 5 birds!

FULMAR (*Fulmarus glacialis* (Linn.).

935, 936. 2 Males, 2 Females; St. Kilda; 5th and 7th June, 1902.—All 4 examples contained the buccal organs of cephalopods.

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